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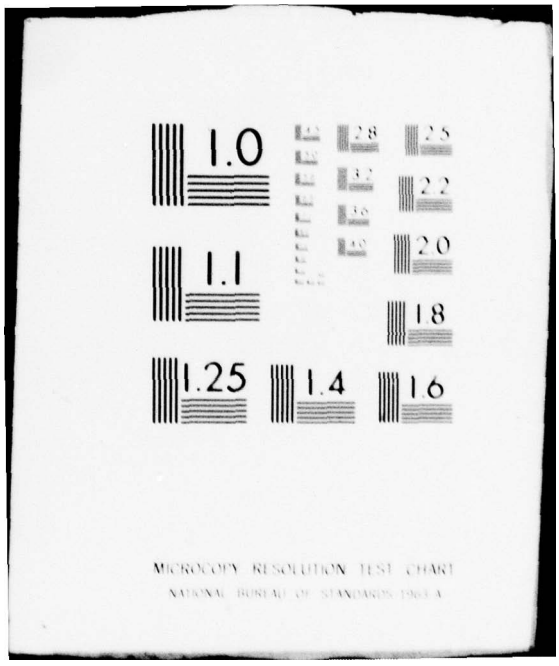
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SCHUYLKILL RIVER BASIN
LITTLE MAHANOY CREEK, SCHUYLKILL COUNTY
PENNSYLVANIA
ID NO. PA. 00659
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ASHLAND DAM

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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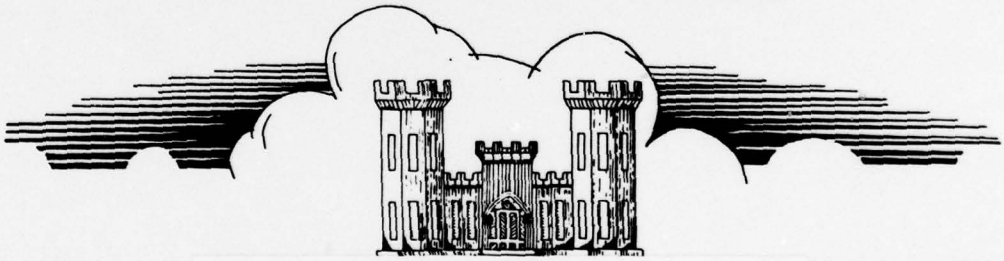

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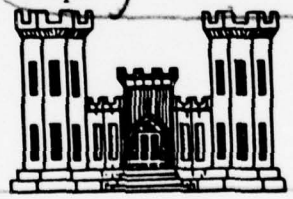
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

SEPTEMBER 1978

SCHUYLKILL RIVER BASIN

ASHLAND DAM
SCHUYLKILL COUNTY, PENNSYLVANIA
NATIONAL I.D. NO. PA 00~~659~~ 671

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



Prepared by:

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Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

JOB

(11) September 1978

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Ashland Reservoir
County Located: Schuylkill County
State Located: Pennsylvania
Stream: Little Mahanoy Creek
Coordinates: Latitude 40° 46.7' Longitude 75° 15.7'
Date of Inspection: 18 August 1978

Ashland Reservoir is owned by the Borough of Ashland and the reservoir supplies drinking water to the Borough and surrounding area. The dam was designed by Gannett, Fleming, Corddry and Carpenter, Incorporated and was constructed in 1925 and completed in December, 1926. The facility is assessed to be in fair condition with the exception of the seepage emanating through the downstream embankment slope and along the toe.

This seepage was noted immediately after filling of the reservoir and the locations have remained essentially unchanged since 1939. In 1930, weirs were installed and measurements were recorded between 1930 and 1940. After 1940 there was no documentation available. The weirs have since been removed and between 1940 and the present, changes in the quantity of seepage could not be determined.

Calculations indicate that the existing spillway systems are adequate to pass the probable maximum flood (PMF). Therefore, the spillway is considered to be "Adequate". The dam is classified as an "Intermediate" size structure consistent with its height of 69 feet. The dam is classified as a "High" hazard dam because of the downstream residential dwellings along Little Mahanoy Creek and further downstream into the Borough of Gordon, Pennsylvania. In the event of failure, extreme property damage is expected with the possibility of loss of life.

Although the structure is considered to be in relatively fair condition, the following recommended measures should be undertaken. These recommendations are presented in order of priority but does not indicate that the latter recommendations are not important.

1. The embankment seepage, particularly seepage along the left side of the dam, should be evaluated and the seepage rates monitored and checked on a periodic basis for changes in rates or turbidity.

2. A series of piezometers should be installed across the dam perpendicular to the centerline to delineate the phreatic profile. These piezometers should be installed and the results evaluated by a registered professional engineer.

3. A plan should be developed for closing off the pipes at the upstream side of the dam for periodic inspection and in the event of the pipes rupturing beneath the embankment causing a hazardous condition.

4. The blow-off and water supply pipes should be inspected to determine their condition. It is noted that these pipes are 40 years old and have never been inspected.

5. Vegetation in the emergency spillway beyond the concrete slab should be removed and the spillway cleaned.

6. The rodent hole shown on Sheet 5a, Appendix B should be filled.

The Owner should develop an inspection checklist together with an operation and maintenance procedure to insure that all items are properly and periodically inspected, operated and maintained.

Because of the downstream population, particularly in Gordon, a formal procedure of operation and warning during periods of high precipitation should be developed and implemented.

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Maryland Registration 7301
Woodward-Clyde Consultants

9/22/78
Date

W S Gardner

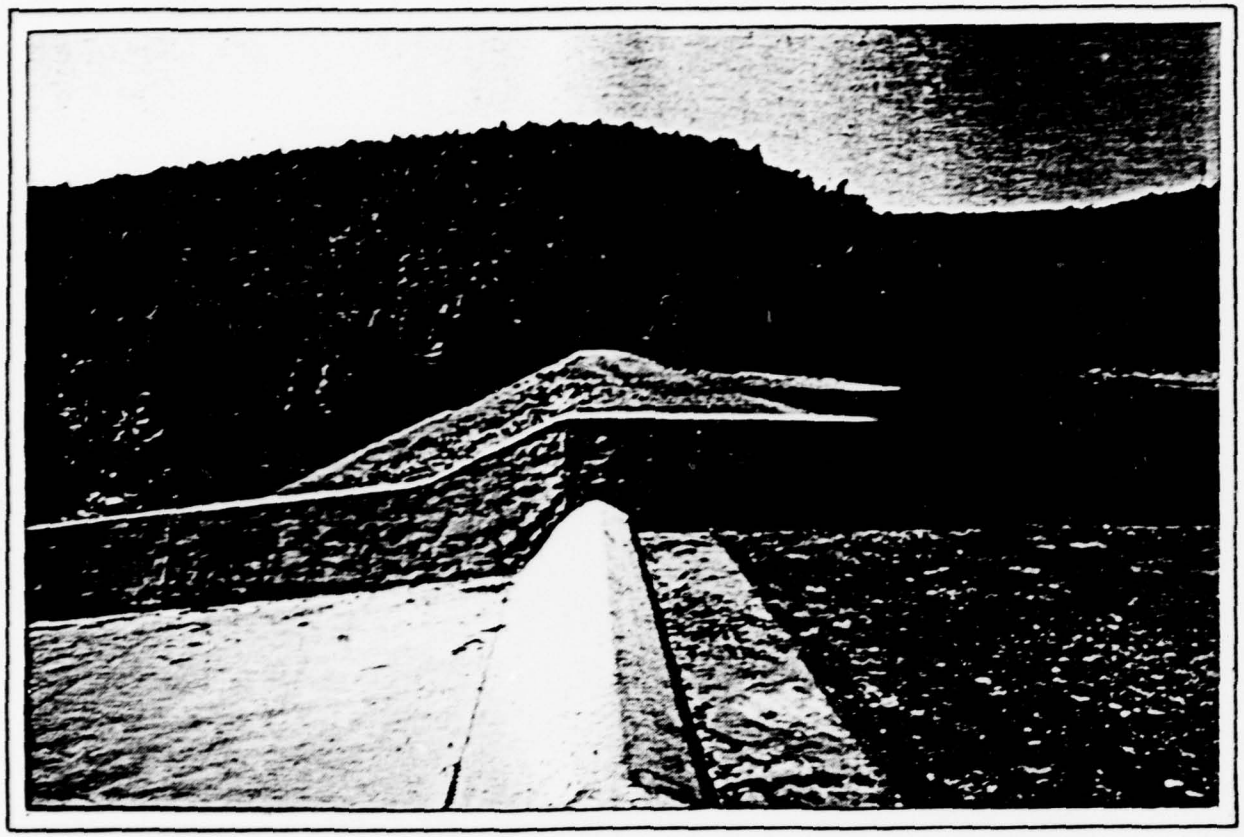
William S. Gardner, P.E.
Pennsylvania Registration 4302E
Woodward-Clyde Consultants

9/22/78
Date

APPROVED BY:

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

28 Sep 78
Date



OVERVIEW
ASHLAND RESERVOIR, SCHUYLKILL COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
ASHLAND RESERVOIR
NATIONAL I.D. #PA 00~~659~~ 671
DER I.D. #54-75

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Ashland Dam is a rolled earth embankment with a concrete core wall founded approximately 10 feet into rock. The embankment is approximately 69 feet high at its maximum section with a length of approximately 500 feet impounding a reservoir of approximately 331 acre-feet. The upstream slope is riprapped from the crest to the toe. The downstream slope contains a rock toe drain and is grass covered. The embankment was constructed over an existing 20 feet high dam which became the upstream toe of the new embankment. ~~A typical embankment profile and section is shown on Plate 5, Appendix E.~~ The principal intake system consists of two pipes located at the base of the dam which are used for water supply and for blow-off. The larger pipe, 16 inches I.D., feeds water into a treatment building at the downstream toe of the embankment. The smaller, 12 inch I.D,, pipe also feeds water through the pumphouse and discharges into a blow-off pit approximately 40 feet below the structure. Excess water is discharged over the spillway located on the left abutment. The concrete ogee spillway is approximately 63 feet wide and discharges into the natural stream channel about 400 feet below the dam centerline.

b. Location. The dam is located on Little Mahanoy Creek approximately 4.5 miles east of the Borough of Ashland. The dam and reservoir are located in Butler Township, Schuylkill County, Pennsylvania.

The dam site and reservoir are shown on the USGS Quadrangle entitled, "Ashland, Pennsylvania" at coordinates N 40° 46.7', W 76° 15.7'. A regional location plan for Ashland Dam and Reservoir is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size structure consistent with its height of 69 feet.

d. Hazard Classification. A "High" hazard classification is assigned because of the downstream residential dwellings along Little Mahanoy Creek and further downstream in the Borough of Gordon, Pennsylvania. The structures along the creek and at Gordon are shown on Plate 1, Appendix E.

e. Ownership. The dam is owned and maintained by the Borough of Ashland, Pennsylvania. All correspondence should be sent to Mr. Edward H. Watkins, Borough Manager, Borough of Ashland, 501 Chestnut Street, Ashland, Pennsylvania 17921.

f. Purpose of Dam. The purpose of this dam is for water supply to the Borough of Ashland.

g. Design and Construction History. Prior to the construction of this dam, there were two dams on Little Mahanoy Creek. Dam No. 1 was constructed in 1876 and impounded approximately 3 million gallons. Dam No. 2 is located at the present site of Ashland Dam and impounded approximately 7 million gallons. This dam was built sometime around 1900. In 1915, Mr. F.H. Shaw, Consulting Engineer, Lancaster, Pennsylvania, was contracted by the Borough of Ashland to design a dam to replace the original two dams. Mr. Shaw prepared a set of construction drawings, the contract and specifications. The application report was submitted on 13 March 1916. However, due to circumstances which are not clear in the available documentation, this dam was never constructed. In 1920, the State inspected the dam and directed the Borough to remove flash-boards from the spillway and repair and strengthen the dam. In 1924, the Borough of Ashland contracted Gannett, Seelye and Fleming, Engineers, Inc., Harrisburg, Pennsylvania, to design a dam to replace Dam No. 2. The application report was submitted on 7 February 1925 by the Borough of Ashland and the permit to construct the dam was issued on 25 February 1925. On 21 February 1925 Mr. George Beal, Division Engineer for the State of Pennsylvania, issued a "Report Upon the Application of the Borough of Ashland" which described the proposed dam and impoundment. Gannett, Seelye and Fleming issued the specifications in 1925 and construction

started in June of the same year. The contractor was the Pottsville Construction Company. Mr. William K. Ward was the Resident Engineer for the Designer, Gannett, Seelye and Fleming, Engineers, Inc. A cut-off wall was excavated approximately 10 feet into rock and grouting was performed at the base of the core wall. The limited documentation and available construction photographs indicate that a single line grout curtain was installed with holes drilled approximately 25 feet deep and ranged from 6 to 9 feet on center. A core wall was build simultaneously with the embankment. Fill materials were placed in 8 to 10 inch lifts with borrow materials obtained about 4,000 feet above the dam site.

Adverse weather conditions halted construction during the winter of 1925 and work resumed in the spring of 1926. A routine inspection by the State on 29 May 1926 disclosed several problems with the quality of earthworks. The compaction was considered insufficient, as lift thickness exceeded the specified 8 inches and were not of uniform thickness and large stones were not being removed from the fill. The Designer's Resident Engineer corrected these deficiencies and work then progressed smoothly. State inspection reports indicate that concrete work was performed in a highly satisfactory manner. The dam was completed and accepted by the Borough on 1 December 1926.

Immediately upon filling of the reservoir leakage was noted on the embankment. This leakage was noted predominantly along the left side of the embankment and ranged from the toe to as much as 20 feet up the slope. This seepage was closely monitored for the next three years and in September 1929, as the amount seemed to be increasing, the State directed that weirs be installed to monitor this seepage. These weirs were installed by the Owner in June 1930, and weir measurements were taken from 1930 to 1940. Thereafter, there was no documentation in either the Department of Environmental Resources (DER) files or the Owner's files. In 1938, the Owner installed a french drain system at the base of the dam to alleviate the swampy condition at the toe. A blow-off pit was also installed just below the dam (see Plate 4, Appendix E).

It is noted that waste water from Frackville, at the upper end of the watershed, is discharged into the Little Mahanoy Creek. Since the late 1800's the waste water has been routed around the reservoir by a series of flumes and ditches. The flumes and ditches were reconstructed in 1925. In 1971 the flumes were rehabilitated under specifications prepared by Gannett Fleming Corddry & Carpenter.

In 1955, the Owner requested that the spillway be raised one foot to impound more water. This request was denied by the State because of the seepage emanating from the toe and the embankment area. Just prior to 1976 a downstream dike was installed immediately below the blow-off pit. (See Plate 4, Appendix E) This dike was constructed to control the spillway discharge.

h. Normal Operating Procedures. Under normal operating procedures, water enters the water supply pipe at the upstream toe and is fed by gravity to the treatment building at the downstream toe. Water is treated at the plant, transferred to the Borough of Ashland by gravity and pumped to a standpipe. In the event of an emergency, the blow-off pipe, which is under full hydrostatic head, can be opened by means of a valve in the treatment building. This water is discharged into a blow-off pit and then to the natural stream channel. Excess water flows over the spillway located at the left abutment of the structure. There are no minimum flow requirements downstream.

1.3 Pertinent Data.

A summary of pertinent data for Ashland Reservoir is presented as follows:

a.	Drainage Area (sq. miles)	2.13
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood (October 1976)	40
	Maximum Design Flood	1,870
	Freeboard Flood	3,390
	Discharge at PMF	2,715
	Minimum Required Flow	None
c.	Elevations (feet above MSL)	
	Top of Dam	1,306.0
	Emergency Spillway	1,300.0
	Blow-off Invert (approx.)	1,235.0
	Water Supply Invert (approx.)	1,235.0
	Normal Pool	1,300.0
	Maximum Known Flood	1,300.3
d.	Reservoir (miles)	
	Length at Normal Pool	0.4
	Fetch at Normal Pool	0.1
e.	Storage (acre-feet)	
	Normal Pool	331
	Top of Dam	410

f.	Reservoir Surface (acres)	
	Normal Pool	14.5
g.	Dam Data	
	Type	Earth embankment with concrete core wall and downstream rock toe
	Length	500 feet
	Height	69 feet
	Crest Width	18 feet
	Side Slopes	
	Upstream	
	Crest to Elev. 1291	2H:1V
	Elev. 1291.0 to Toe	2.5H:1V
	Downstream	2H:1V with a 4 foot bench at Elev. 1276.0
	Cutoff	Concrete core wall
	Grout Curtain	Yes. Single line grout curtain, holes are 6 to 9 feet on center and approximately 25 feet deep
h.	Water Supply and Blow-off Data	
	Water Supply	16 inch pipe
	Blow-off	12 inch pipe
	Description	Both pipes lead from intake at upstream toe through embankment to the treatment facility at downstream toe
i.	Spillway	
	Type	Concrete ogee section
	Location	Left abutment
	Width	63 feet
	Discharge Chute	Concrete and rock

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. There were no original design calculations available for review. A summary of data available in the files is presented in the checklist attached as Appendix A. Drawings were very limited. Those that were available have been reproduced in Appendix E of this report as Plates 2 through 9. Principal documents containing pertinent data used for this investigation are as follows:

1. "Report Upon the Application of the Borough of Ashland", prepared by Mr. George S. Beal, Division Engineer for the State of Pennsylvania.

2. Twenty-four black and white photographs dated 1925 which document several construction procedures.

3. Twelve sheets of blueprints prepared by Gannett, Seelye and Fleming, Inc. of Harrisburg, Pennsylvania which are the construction drawings for this dam.

4. State Inspection Reports from 1925 to 1976.

5. Contract Specifications by Gannett, Seelye and Fleming, Inc. of Harrisburg, Pennsylvania, dated 1925, describing the construction requirements.

6. Miscellaneous letters, correspondence, memos, including inspection progress reports, all of which are located in Department of Environmental Resources (DER) files in Harrisburg, Pennsylvania.

b. Design Features. The principal design features of Ashland Reservoir and appurtenant structures are illustrated on the plans, profiles and cross sections that are enclosed as Appendix E as Plates 2 through 9 and reproduced from the blueprints found in DER files. A brief description of the dam is in Section 1.2 of this report. A more comprehensive description is presented as follows.

Ashland Dam was constructed at the location of the pre-existing Dam No. 2. The old Dam No. 2 was incorporated in the upstream portion of the embankment. Prior to construction of this dam, the old rubble wall was removed and vegetation removed from the pre-existing dam. The remaining embankment was used to retain water and facilitate construction of the new embankment. Construction photographs show that the foundation was stripped and a core wall was excavated.

Design documents show that the core wall extends approximately 10 feet into rock and is located 8 feet downstream of the centerline. The embankment is homogeneous with an upstream slope of 2H:1V from the crest to elevation 1291. From elevation 1291 to the toe, the slope is 2.5H:1V.

The upstream slope is protected with riprap from the crest to the toe. Below elevation 1275, the riprap is 18 inches thick. Above elevation 1275, the riprap is also 18 inches thick but has a 6 inch filter bed. The crest of the dam is at elevation 1306 and the crest width is 18 feet.

The downstream slope is 2H:1V with a 4 foot berm at elevation 1276 and a rock fill toe. A typical section is shown on Plate 5 of Appendix E.

The maximum discharge capacity of the spillway is 3390 cfs. The spillway is excavated into rock on the left abutment of the structure. The concrete ogee crest is 63.0 feet long and the chute is paved for 115 feet downstream and then becomes a rock channel. Polluted water from the Frackville portion of the watershed is diverted by a system of flumes and ditches on the south side of the reservoir and discharges adjacent to the spillway.

The intake structure at the upstream toe houses a 16 inch water supply pipe and a 12 inch blow-off line. Both pipes are encased in concrete and pass through the base of the dam into a treatment building at the downstream toe. Water is discharged to the Borough of Ashland by gravity and then pumped to a standpipe. The blow-off pipe passes through the treatment building and discharges into a blow-off pit approximately 40 feet downstream of the treatment building.

2.2 Construction.

A description of the construction history is presented in Section 1.2. The dam was designed and the construction supervised by Gannett, Seelye and Fleming, Inc., Harrisburg, Pennsylvania. The Contractor was the Pottsville Construction Company.

2.3 Operation Data.

The only operational records maintained are the flow rates supplied to the Borough of Ashland. Flows are metered by means of a Simplex flow meter, (Serial No. 12-400-4272).

There is no operational manual or maintenance manual. Under normal conditions, water is fed to the water supply system by means of a 16 inch pipe which has an intake at the upstream toe of the dam. This pipe and the blow-off pipe are under full hydrostatic head and are controlled by valves in the control house.

2.4 Evaluation.

a. Availability. All engineering data obtained and reviewed as part of this investigation were provided by the Department of Environmental Resources and supplemented by conversations with the Borough Manager, Mr. Watkins.

b. Adequacy. The data available was judged to be sufficiently adequate to make a general evaluation of this facility. It is noted that there were no design computations available nor was there a detailed hydrologic/hydraulic analysis. Selected features of the dam which included the crest width, downstream slope, emergency spillway dimensions and other miscellaneous data were field-checked and compared with the drawings prepared by Gannett, Seelye and Fleming, Inc. These checks indicate that the dam was dimensioned in accordance with the drawings. Therefore, it is assumed that other design features on the drawings were constructed as shown. Based on this assumption and the available photographs, correspondence and other letters, it was judged that the data available was sufficient to enable a generalized evaluation of the dam and appurtenant facilities.

c. Validity. There is no reason to question the validity of the data.

SECTION 3
VISUAL INSPECTIONS

3.1 Findings.

a. General. The observations and comments of the Field Inspection Team are contained in the checklist enclosed herein as Appendix B and are summarized and evaluated as follows. In general, the appearance of the facility indicates that the dam is regularly maintained and in good condition.

b. Dam. During the visual survey, there was no evidence of embankment distortion of crest subsidence that would be indicative of foundation settlement, movement or imminent failure of the embankment and along the toe in the vicinity of the french drain system. Exposed portions of the french drains were inspected and noted to be functioning. The seepage noted on the downstream face was compared to a photogragh taken on 16 May 1939 by Mr. E. G. Langan, DER, and the seepage noted in that photograph was compared to seepage noted during this 1978 inspection. There has apparently been no change in seepage rates or location since 1939. In fact, the location of seepage noted in the 1978 inspection was confined to the left portion of the downstream embankment. Seepage is shown on sheet 5a, Appendix B. Photographs of the seepage are shown in Appendix D.

The upstream riprap was inspected above the water line and observed to be in good condition with no signs of movement or significant deterioration. Embankment/abutment contacts were inspected and observed to be in good condition.

c. Appurtenant Structures.

1. Intake Pipes: The two intake pipes are at the base of the dam are connected to the treatment building. These pipes could not be observed during the visual inspection. The valves and the pipes within the treatment building were inspected and observed to be in good condition

2. Spillway: The approach channel to the spillway was inspected and the concrete wall was found to be in good condition on both the left and right abutments. The spillway crest was also inspected and there were no signs of significant deterioration, spalling or other features that would be detrimental to the performance of the spillway. Some minor spalling was noted, but had been satisfactorily

patched and is in good condition. The channel is excavated through rock and narrows from the spillway crest width of 63 feet to a channel width of approximately 9 feet about 400 feet downstream. During very large storms, it is expected that the channel would overflow. However, it is judged that this will not affect the spillway capacity or the stability of the dam.

d. Reservoir. Reconnaissance of the reservoir disclosed no evidence of significant siltation, slope instability, or other features that would significantly affect the flood storage capacity of the reservoir. All slopes are well vegetated with an assortment of hardwood and softwood trees.

e. Downstream Channel. Immediately downstream, the spillway discharges into the natural stream channel and flows along a gravel bottom channel to a public road. At this point the stream passes under a bridge as shown on Photograph 14. During high flows it is expected that this bridge would be under water.

Between the dam and this first bridge, the stream flows through a wooded steep narrow flood plain. The valley grading is approximately 3.6 percent and the channel banks are low with side slopes of approximately 2H:1V. Between 1.7 and 2.6 miles downstream of the dam there are three houses built adjacent to the stream. Approximately 4.3 miles downstream of the dam the channel passes the Borough of Gordon, Pennsylvania, which is reportedly flooded periodically and would suffer extensive damage in the event of dam failure.

3.2 Evaluation.

In summary, the visual survey of the dam disclosed that the embankment is in fair condition. The seepage noted on the downstream slope has apparently not changed since 1939. The tile drains located at the base of the dam are apparently functioning fairly well and are draining the area.

Since the water supply and blow-off pipes are buried beneath the embankment, these systems could not be inspected. The spillway was inspected and assessed to be in good condition.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Normal operating procedure does not require a dam tender. A caretaker lives near the upper end of the reservoir and the dam is checked daily and constantly during large storms. The dam tender's principal observation during high flow periods is to observe if contaminated water from the Frackville area enters the reservoir. Subsequent to the passage of large storms, the spillway is checked for deterioration or damage due to the storm. The Owner's representative indicated that the dam is inspected daily to determine if unusual seepage is developing and to assess the water supply and chlorination systems.

4.2 Maintenance of Dam.

The last known maintenance to this structure was performed by the Owner in August 1978. At that time, vegetation was cleared from the downstream slope. Several years prior to this, the right retaining wall of the spillway was reconstructed and a dike was constructed downstream to channel spillway flow into the natural stream channel.

4.3 Maintenance of Operating Facilities.

There are no written maintenance procedures for the dam. Since the dam was completed in 1925, there are no records to indicate that the blow-off or water supply pipes have been checked. The portions of the pipe located in the treatment building are periodically cleaned, painted and are kept in very good condition. The valves were also inspected and found to be clean, well lubricated and operating properly.

4.4 Warning Systems in Effect.

There are no formal warning systems or procedures established to be followed during periods of exceedingly heavy rainfall. A representative of the Borough monitors the dam and appurtenant facilities during periods of heavy rainfall and this appears to be a satisfactory means of monitoring the dam. In the event that an emergency condition develops, the local Borough officials would be notified by the caretaker.

Since the access road follows the streambed up to the dam, it is judged that the road could be flooded out during large flows from the dam. The Owner's representative indicated that an alternate route to the dam is possible through the woods.

4.5 Evaluation.

There are no operating procedures nor are there any warning systems or procedures established to be followed during periods of exceedingly heavy rainfall or in the event of an emergency. Commensurate with the possibility of loss of life and extreme downstream property damage. In the event of failure or exceedingly high flows, a formal warning procedure should be implemented.

An operating procedure, together with an inspection checklist, should also be formulated and implemented by the Owner. As part of the operational manual, a maintenance inspection checklist should also be formulated. The listing of items to be inspected should include all control valves and appurtenant facilities. Since the water supply pipes have not been inspected since 1925, these pipes should be evaluated in the near future to determine the condition and service life of the systems.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. Original design data available was limited to a few statements in the application report, dated 21 February 1925. The watershed is approximately 1.1 miles long and averages 0.9 miles wide, totaling 2.13 square miles. Elevations range from 1,805 on Broad Mountain to the south, to 1,300 at the normal reservoir level. The watershed is approximately 50 percent wooded with about 50 percent residential in the Borough of Frackville.

In order to avoid building an infiltration plant at the time that the present dam was built, runoff from the Frackville portion of the watershed was diverted around the reservoir by a combination of concrete flumes and channels excavated into rock. Originally 0.75 square miles of the watershed drained directly into the reservoir. Runoff from the mountains to the south entered the reservoir either over or under the flumes. A trough that passed over the diversion near the discharge end is no longer in existence. The area that currently drains directly into the watershed, as determined from current USGS maps, is about 0.59 square miles.

The spillway was designed to discharge 1,870 cfs with a 4 foot head, equivalent to a runoff of 875 cfs per square mile, a value considered ample. In accordance with the criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard potential classification is the probable maximum flood (PMF).

b. Experience Data. The reservoir levels are recorded daily and the precipitation records are kept in the office in Ashland. The highest reservoir level recorded occurred on 9 October 1976 after three days of rain totalling 12.2 inches. The reservoir level was 4 inches above the spillway, an estimated discharge of 40 cfs. It is noted that the reservoir was not at full pool prior to this storm.

c. Visual Observations. On the date of the inspection, no conditions were observed that would indicate the outlet capacity of the spillway would be reduced during a flood. It is possible that a major storm could cause trees to fall into the diversion, partially blocking and causing the flume and ditch to overtop into the reservoir. Observations regarding downstream channel, spillway conditions and reservoir are located in Appendix B.

d. Overtopping Potential. The maximum spillway capacity is calculated to be 3,390 cfs with the reservoir level at the top of the dam (see Appendix C). The capacity of the diversion flume, 1,300 feet above the outlet, is estimated to be 910 cfs based on dimensions in a 1971 drawing prepared by Gannett Fleming Corddry & Carpenter. Information received from the Corps of Engineers, Baltimore District, indicated 2,715 cfs for the 2.13 square mile watershed. As shown in Appendix C, the diversion flume will overtop into and drain the reservoir. As the capacity of the spillway is judged to be greater than the estimated peak PMF inflow from the entire watershed, overtopping of the dam would not be expected during the PMF storm.

e. Spillway Adequacy. As the spillway capacity exceeds the estimated PMF inflow, the spillway is rated as "Adequate". The tailwater during passing of the PMF storm is estimated to be approximately 70 feet below the top of the dam.

f. Downstream Conditions. Approximately 1.4 miles below the dam the stream passes under a highway bridge. The bridge is estimated to flood when the flow under it is greater than 2,170 cfs. Within the next 2.8 miles are at least three homes built adjacent to the stream that are subject to flooding in the time of high flow and would be damaged or destroyed in the event of failure. Approximately 4.2 miles below the dam discharge passes through the Borough of Gordon which is subject to flooding during periods of high rainfall. In Gordon, the stream passes through a culvert under the Reading Railroad. The culvert has been blocked several times in the past with debris, causing flooding during major storms. If the dam were to fail during passing of a PMF storm, there is the potential for considerable damage and possible loss of life; thus, justifying a "High" hazard classification.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. The visual inspection of Ashland Dam and Reservoir and its appurtenant facilities indicated no existing embankment stability problems or significant structural deficiencies associated with the spillway. The water supply and blow-off pipes could not be inspected because they are buried under the embankment.

The riprap on the upstream embankment was found to be in good condition and the quality of rock was assessed to be good. The downstream slopes showed no signs of distortions, undulations or other evidence to indicate that the embankment was in an unstable condition.

Seepage was noted downstream along the embankment as shown on Sheet 5a, Appendix B. This seepage was also noted during a 1939 inspection and, based on the observations at that time, there appears to be no significant increase in the seepage rates since that inspection. However, this seepage is undesirable and should be monitored. The downstream toe area was damp and marshy along the right abutment as shown on Sheet 5a of Appendix B. Evaluation of this area showed the terra-cotta pipe and the tile drains installed in 1938 to control downstream toe leakage were functioning.

The spillway was inspected and observed to be in relatively good condition. There were not signs of excessive deterioration, cracking or general degradation of the unlined rock channel.

b. Design and Construction Data. All available design documentation, including construction drawings, progress reports, and other miscellaneous correspondence, was reviewed and assessed for completeness. A detailed listing of this data is included herein as Appendix A and discussed in Section 2.

The design documentation was, for the most part, relatively incomplete. There was no hydrologic/hydraulic design calculations, stability analysis or structural calculations pertinent to the attendant facilities. The only design data available was the summary provided in the "Report Upon the Application" dated 21 February 1925.

Although stability analysis were not performed, the long term performance record, and the configuration of

the embankment together with the compaction documentation was evaluated to make a quantitative assessment of stability. Correspondingly, it is judged that the embandment is likely to remain stable under conditions similar to those currently prevailing.

The complete set of construction drawings consisting of twelve blueprints prepared by Gannett, Seelye and Fleming Engineers, Inc. of Harrisburg, Pennsylvania, were available. These drawings were sufficient to evaluate the physical features of the structure and pertinent features are reproduced in Appendix E. Construction photographs aided in the evaluation of the construction aspects of this facility and were supplemented by inspection reports and progress reports prepared by the State of Pennsylvania.

c. Operating Records. There are no minimum flow requirements downstream of the structure. The resident caretaker takes water level measurements daily and monitors the rate water is used by the Borough of Ashland. The storm of 9 October 1976 is the storm of record and a flow of 4 inches was recorded over the spillway which is equivalent to approximately 40 cfs. There is no maintenance checklist nor are maintenance records kept.

d. Post-Construction Changes. Since completion of this dam in 1926, there have been no major changes to this structure. In 1930, weirs were installed and between 1930 and 1940 measurements of leakage were taken. There are no records in the Department of Environmental Resources files after 1940. In 1938, a drain system was installed at the downstream toe of the embankment as was a blow-off pit. At about this same time, downstream Dam No. 1 was removed. Around the mid-1970's a dike was constructed downstream of the blow-off pit. (See Plate 4, Appendix E.) The purpose of this dike was to divert all spillway flow into the natural stream channel. There have been no other modifications made to the dam other than rehabilitation of the water supply outlet works.

e. Seismic Stability. The dam is located in Seismic Zone I. Normally it can be considered that if a dam in this zone is stable under static conditions, it can be assumed safe for any expected earthquake conditions. Since the static stability analysis was not available for review, the seismic stability of the dam could also not be quantified.

SECTION 7
REMEDIAL MEASURES

7.1 Dam Assessment

a. Evaluation. The visual inspection and review of available documentation indicates that the embankment and appurtenant structures of Ashland Reservoir are in generally fair condition. There were no signs of crest or slope discontinuities nor were there signs of riprap movement on the upstream slope. There was evidence of seepage through the downstream slope approximately 30 feet above the toe. This seepage was noted in 1939 and a photograph of that area taken in 1939 indicates that there is no significant change in the seepage since that date.

The spillway approach and discharge channels were inspected and found to be in good condition. There was no evidence to indicate that a potentially unstable or dangerous condition was developing.

The water supply and reservoir drainage systems could not be inspected in that the intake structure is located at the upstream toe below reservoir level and the pipes are buried in the embankment. The only exposed portions of these systems are the pipes and valves within the treatment building. These were inspected and judged to be in good condition and well maintained.

Although hydrologic and hydraulic calculations were not available for this reservoir, approximate calculations as recommended by Federal (OCE) Guidelines indicate that the dam will pass the probable maximum flood; and therefore, the spillway is considered to be "Adequate".

b. Adequacy of Information. Although there were no structural calculations available, there was sufficient documentation in the files to indicate that the construction was supervised by the Design Engineer and inspected by the State, and construction was performed in accordance with the Designer's recommendations. It is concluded that the information available for this assessment is adequate.

c. Urgency. It is considered that the recommendations presented below be implemented as soon as practical.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be undertaken. These recommendations are presented in order of priority but do not indicate that the latter recommendations are unimportant.

1. Embankment seepage, particularly seepage along the left side of the dam, should be evaluated and the rates of seepage monitored and checked on a periodic basis for changes in rates or changes in turbidity.

2. Piezometers should be installed across the embankment to delineate the phreatic surface so the seepage can be evaluated. This work should be performed under the direction of a registered professional engineer.

3. A plan should be developed for closing off the pipes at the upstream side of the dam for periodic inspection and in the event of the pipes rupturing beneath the embankment causing a hazardous condition.

4. The blow-off and water supply pipes should be inspected to determine their condition. The pipes are 40 years old and have never been inspected.

5. Vegetation in the emergency spillway beyond the concrete slab should be removed and the spillway cleaned.

5. The rodent hole noted as shown on Sheet 5a, Appendix B should be filled.

b. Operation and Maintenance. The Owner should develop an inspection checklist together with an operation and maintenance procedure to insure that all items are properly and periodically inspected, operated and maintained.

Because of the downstream population, particularly in Gordon, Pennsylvania, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents that high flows are to be expected along the creek.

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APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Ashland Reservoir*

ID # *PA 00~~669~~671*

ITEM	REMARKS
AS-BUILT DRAWINGS	*No. However, there are 19 blueprints in DER files. Appropriate information is presented in Appendix E.*
REGIONAL VICINITY MAP	*Yes. A regional location plan is presented on the blueprints with drawings prepared by Gannett, Fleming, Corddry and Carpenter; and in Appendix E, Plate 1 of this report.*
CONSTRUCTION HISTORY	*DER files contained sufficient data to reconstruct the construction history of this facility.*
TYPICAL SECTIONS OF DAM	*Yes. Data was included on blueprints located in DER files and presented in this report as Plate 3, Appendix E.*
OUTLETS - PLAN	*Data is presented on blueprints located in DER files.*
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	*A volume curve is located at Borough Hall. No discharge curves are available.*
RAINFALL/RESERVOIR RECORDS	*Nearest gage is located at the Borough Hall and used only for local records.*

ITEM	REMARKS
DESIGN REPORTS	*None. However, there are specifications and several letters of correspondence which present design data without any backup.*
GEOLOGY REPORTS	*None. Geologic data is presented in Appendix F of this report.*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*None available.*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*See Gannett, Fleming Corddry and Carpenter's report (1970)*
POST-CONSTRUCTION SURVEYS OF DAM	*Gannett, Fleming, Corddry and Carpenter prepared a rehabilitation report, 1971, which reevaluated the structure.*
BORROW SOURCES	*Unknown.*

ITEM	REMARKS
MONITORING SYSTEMS	*None. They have an order for a turbidity meter but no other instruments are installed.*
MODIFICATIONS	*Yes. See text of report for details.*
HIGH POOL RECORDS	*Yes. These are available and housed in the Borough Office. Records are complete and contains a tabulated rating curve. 8 April 1973 1" Storm of Record: 7-9 October 1976 12.2" (1 foot below on 7 October to 4" on 9 October over spillway).*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*Yes. Reports are prepared by Garnett, Fleming, Corddry and Carpenter. Latest report is dated 1971 for spillway repairs.*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None. Sluice way bypass failed in 1955 and polluted the reservoir.*
MAINTENANCE OPERATION RECORDS	*Records are kept at the site and in the Borough Hall.*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*Yes. Data is presented in Appendix E.*
OPERATING EQUIPMENT PLANS & DETAILS	*Details of the equipment were presented on the blueprints.*

MISCELLANEOUS

1. *"Construction documents for Flume Rehabilitation", by Gannett, Fleming, Corddry and Carpenter, Harrisburg, Pennsylvania, August 1971.*
2. *1970 Boring Logs by Gannett, Fleming, Corddry and Carpenter, 1970.*
3. *19 Blueprints of the dam and appurtenant facilities. Selected section of the plans are presented in Appendix E.*
4. *F.H. Shaw, Consulting Engineer, Lancaster, Pennsylvania was the design engineer for this structure, 1916.*
5. *Pottsville Construction Company was the General Contractor, 1916.*
6. *Application Permit, 7 February 1925 and 13 March 1916.*
7. *Construction Permit dated 7 February 1925.*
8. *Inspection Reports from 1920 to 1976 as submitted by the State.*
9. *Construction Specifications, December 1915, for Ashland Dam.*
10. *"Contract and Specifications for Impounding Reservoir", by Gannett, Seeyle and Fleming, Harrisburg, Pennsylvania, February 1926*
11. *"Report Upon the Application of the Borough of Ashland", 21 February 1925.*

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Ashland Reservoir* County *Schuylkill* State *Pennsylvania* National ID # *PA 00~~660~~ 671*

Type of Dam *Rolled Earth* Hazard Category *I (High)*

Date(s) Inspection *18 Aug. 1978* Weather *Warm, Hot, Sunny* Temperature *90's*

Pool Elevation at Time of Inspection *-4± ft.* M.S.L. *below normal pool* Tailwater at Time of Inspection *N/A* M.S.L.

Inspection Personnel:

Mary Beck (Hydrologist) *John Boschuk, Jr. (Geotechnical/Civil)*

Vince McKeever (Hydrologist)

John Boschuk, Jr. Recorder

Remarks:

Ronald Maurer - Borough Treasurer *William W. Whyne - Caretaker*

Edward Watkins - Borough Manager and Secretary *All three personnel were on site and provided assistance during the inspection.*

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	*N/A*	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	*N/A*	
DRAINS	*N/A*	
WATER PASSAGES	*N/A*	
FOUNDATION	*N/A*	

CONCRETE/MASONRY DAMS

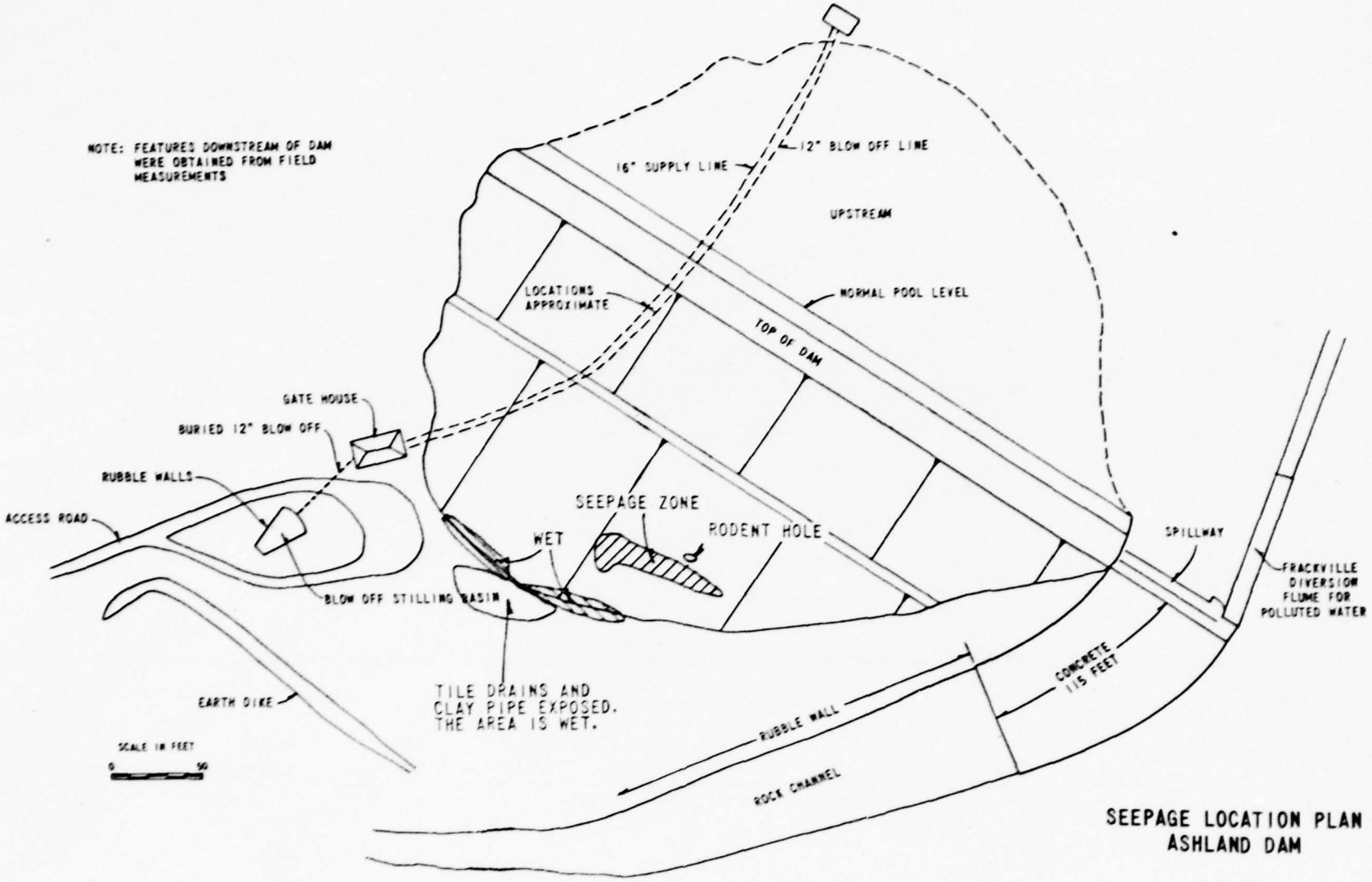
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	*N/A*	
STRUCTURAL CRACKING	*N/A*	
VERTICAL AND HORIZONTAL ALIGNMENT	*N/A*	
MONOLITH JOINTS	*N/A*	
CONSTRUCTION JOINTS	*N/A*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*None observed.*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None observed.*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*None observed.*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*No unusual movements observed.*	
RIPRAP FAILURES	*None observed.*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*The junction appears to be in good condition at both ends of the embankment and both sides of the spillway.*	
ANY NOTICEABLE SEEPAGE	*Yes. Seepage was noted through the embankment approximately one third up the slope from the toe towards the left side of the embankment. This same seepage was noted in a photograph dated 5/16/39 by E.F. Langan. Seepage was emanating as sheet flow. A seepage rate could not be determined. See sheet 5a.*	
STAFF GAGE AND RECORDER	*Side slope staff gage is used to determine reservoir contents. See photograph in Appendix D.*	
DRAINS	*Yes. Tile drains are functioning but seepage is collecting over the tiles at the toe of the left abutment. See sheet 5a and photographs in Appendix D.*	



SEEPAGE LOCATION PLAN
ASHLAND DAM

SHEET 5a OF 11

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*N/A*	
INTAKE STRUCTURE	*N/A. Intake structure is located on upstream side of embankment together with the pond drain. These are underwater and could not be inspected.*	
OUTLET STRUCTURE	*N/A. Pipes within embankment lead directly into pumphouse and only the valves could be inspected. These valves are clean, painted and well maintained. They are normally open and feed water to the town by gravity.*	
OUTLET CHANNEL	*12 inch buried line from dam to city (Borough of Ashland) and other limited areas. The pipe could not be inspected in that it is buried.*	
EMERGENCY GATE	*12 inch bypass line (blowoff) discharges into a stilling basin feet downstream of the pumphouse. See Plate 2 of Appendix E.*	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	*Good condition with only minor spalling. The spalling was patched satisfactorily. The retaining walls are in good condition.*	
APPROACH CHANNEL	*The channel has a gravel bottom and side slopes cut through rock on the left abutment. The channel is in good condition.*	
DISCHARGE CHANNEL	*The channel is excavated through rock and narrows to nine feet wide 400± feet downstream. It is expected to overflow during large storms. See Plate 2, Appendix B.*	
BRIDGE AND PIERS	*None*	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	*N/A*	
APPROACH CHANNEL	*N/A*	
DISCHARGE CHANNEL	*N/A*	
BRIDGE AND PIERS	*N/A*	
GATES AND OPERATION EQUIPMENT	*N/A*	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	*None*	
OBSERVATION WELLS	*None*	
WEIRS	*None*	
PIEZOMETERS	*None*	
OTHER	*None*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*Side slopes steep, stable and well vegetated with trees to the waters edge.*	
SEDIMENTATION	*No significant sedimentation.*	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*Approximately 1.3 miles downstream of dam the stream passes under a road through a 17 foot by 8.2 foot bridge opening. For the first mile below the dam, the stream flows through a wooded, steep, narrow flood plain.*	
SLOPES	*Valley gradient is approximately 3.6 percent. The channel banks are low with side slopes of 2 H:1V.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*Between 1.7 and 2.6 miles downstream of the dam are three houses built adjacent to the stream. About 4.3 miles downstream of the dam is the community of Gordon which is periodically flooded and would suffer extensive damage in the event of dam failure.*	

APPENDIX

C

ASHLAND RESERVOIR
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *About 50 percent wooded, Frackville is located on the upper reaches of the drainage basin.*

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): *1300 (331 Acre-Feet).*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *1306 (410 Acre-Feet est).*

ELEVATION MAXIMUM DESIGN POOL: *1304*

ELEVATION TOP DAM: *1306*

SPILLWAY

a. Elevation *1300*

b. Type *Concrete ogee weir.*

c. Width *62.2 feet.*

d. Length

e. Location Spillover *Left abutment.*

f. Number and Type of Gates *None.*

OUTLET WORKS:

a. Type *Conduit - CIP.*

b. Location *Base of dam.*

c. Entrance inverts *1335.0*

d. Exit inverts *Unknown. ≃ 1330*

e. Emergency draindown facilities *CIP Conduit at base of dam.*

HYDROMETEOROLOGICAL GAGES:

a. Type *Standard rain gage.*

b. Location *At office in Ashland.*

c. Records *At office in Ashland.*

MAXIMUM NON-DAMAGING DISCHARGE: *2170 cfs-the capacity of the first downstream bridge.*

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 9/1/78
By: MFB
Sheet: 2 of 6

DAM Ashland Reservoir Nat. ID No. PA 00671 DER No. 54-75

	ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1.	Min. Crest Elev., ft.	1306.0		
2.	Freeboard, ft.	2		
3.	Spillway(1) Crest Elev, ft.	1300.0		
3a.	Secondary(2) Crest Elev, ft.	-		
4.	Max. Pool Elev., ft.	1304.0		
5.	Max. Outflow(3), cfs	1870		
6.	Drainage Area, mi^2	0.75/2.13		0.59/2.21
7.	Max. Inflow(4), cfs			
8.	Reservoir Surf. Area, Acre	12.85		12.55
9.	Flood Storage(5), Acre-Feet			
10.	Inflow Volume, ft^3			

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

(1) Main emergency spillway.

(2) Secondary ungated spillway.

(3) At maximum pool, with freeboard, ungated spillways only.

(4) For columns B, C, use PMF.

(5) Between lowest ungated spillway and maximum pool.

Date: 9/1/78
By: MFB
Sheet: 3 of 6

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from Sheet 2)	Source
1A, 3A	1971 drawing prepared by Gannett Fleming Corddry & Carpenter
2A, 4A, 5A, 6A	Application Reports dated May 5, 1916 & Feb. 21, 1925
8A	Letter dated Feb. 3, 1949 from Borough of Ashland to the State
6C, 8C	USGS Maps Ashland, PA. (1969) Shenandoah, PA. (1969)

Classification (Ref. Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as "High" as there would be loss of life if the dam failed
2. The size classification is "Intermedate" based on its 69 ft. height.
3. The spillway design flood based on size and hazard classification, is the probable maximum flood (PMF).

Hydrologic and Hydraulic Analysis

1. Original Design Data - was limited to statements in Application Report dated Feb. 21, 1925. A diversion channel / flume by-passes the reservoir carrying Little Mahanoy Creek which receives sewage effluent from upstream Frackville. See Plate 3.
   a. Drainage Area
      Total area above dam = 2.13 sq. miles
      Area draining directly into reservoir = 0.75 sq. miles
      Area intercepted by diversion = 1.38 sq. miles
   b. Spillway Capacity
      Discharge = 1870 cfs w/ H = 4 ft.
      (Equivalent to Runoff of 875 cfs/sq. mile, which is ample)
   c. Diversion - part concrete flume and part excavated channel:
      Channel - bottom width = 10 ft.
      slope 7 inches/100 ft (= 0.0006)
      rock cut
      capacity 850 cfs or 600 cfs/sq mile.
2. Evaluation of Data
   a. Drainage Area - Current USGS Maps support total area value. Area drainage directly into reservoir is about 0.39 sq miles. Apparently, originally more hillside runoff (South of reservoir) was intercepted and carried over the diversion just above its outlet.

BY MEB DATE 9/3/78 SUBJECT Ashland Reservoir Hydrology / Hydraulics SHEET 5 OF 6

CHKD. BY DATE JOB No.

b. Spillway Capacity

Reservoir spillway - drawings indicate original weir length = 63 ft.

$Q = CLH^{3/2}$

$1870 = C \cdot 63 \cdot 4^{3/2}$

$C = 3.71$ – judged a reasonable value

Spillway capacity with reservoir level at top of dam

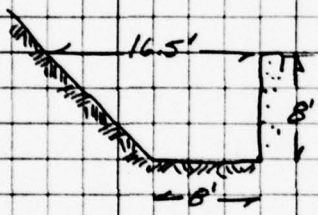
Length field checked = 62.2 ft.

$Q = 3.71 \cdot 62.2 \cdot 6^{3/2}$

≈ 3390 cfs

c. Diversion capacity

At a point about 100 ft. above the outlet



dimensions measured

$n \sim 0.025$ est.

$s \sim 0.01$ est.

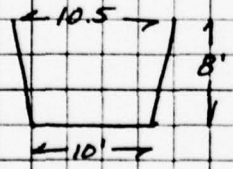
$Q = a \frac{1.486}{n} \left(\frac{a}{w.p.}\right)^{2/3} s^{1/2}$ (Manning Equation)

area, $a_1 = 8\left(\frac{8+16.5}{2}\right) = 98$ ft^2

wetted perimeter, $w.p. = 8+8+11.67 = 27.67$ ft

$Q = 98 \frac{1.486}{0.025} \left(\frac{98}{27.67}\right)^{2/3} 0.01^{1/2} = 1950$ cfs

Flume about 1300 ft. above outlet



Concrete, $n = 0.015$

Slope, $s = 0.00272$ (slope & dimensions from 1971 drawing)

$a = 8\left(\frac{10+10.5}{2}\right) = 82$ ft^2

$w.p. = 2 \cdot 8 + 10 = 26$ ft

$Q = 82 \frac{1.486}{0.015} \left(\frac{82}{26}\right)^{2/3} 0.00272^{1/2}$

$= 911$ cfs

BY MEB DATE 9/9/78 SUBJECT SHEET 6 OF 6

CHKD. BY DATE Ashland JOB No

Hydrology / Hydraulics

3. Overtopping Potential

Information from Corps of Engineers, Balt. District indicates the peak PMF inflow to be 1275 cfs/sq. mile.

Peak PMF inflow directly into reservoir
$0.59 \text{ mile}^2 \cdot 1275 \text{ cfs/mile}^2 = 752 \text{ cfs} <$ capacity of spillway

Peak PMF inflow thru diversion
$(2.13 - 0.59)1275 = 1964 \text{ cfs} >$ capacity of diversion

Total peak PMF inflow = 2715 cfs < capacity of spillway

Therefore, the diversion will be overtopped during the PMF storm. However the spillway capacity is large enough to discharge the entire estimated PMF discharge in the event the diversion overtopped or failed completely.

4. Spillway Adequacy

Based on the above information, the spillway is considered "Adequate."

5. Downstream Conditions

First downstream bridge 17 Ft x 8.2 Ft

No heading on this bridge is possible, therefore estimate capacity by Manning's Equation

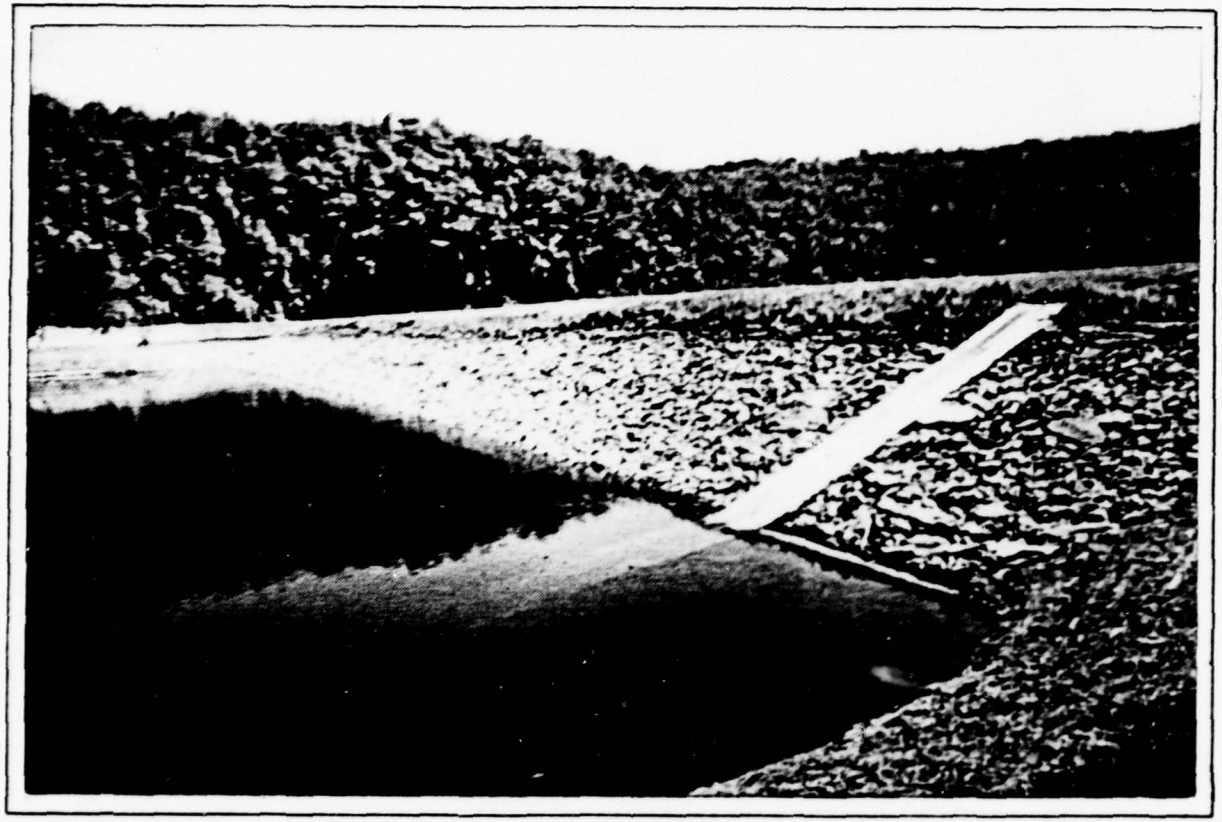
$n = 0.035$ estimated $S = 0.02$ from USGS map.

$$Q = (17 \times 8.2) \frac{1.486}{0.035} \left(\frac{17 \cdot 8.2}{17 + 2 \cdot 8.2}\right)^{2/3} 0.02^{1/2}$$

≈ 2170 cfs

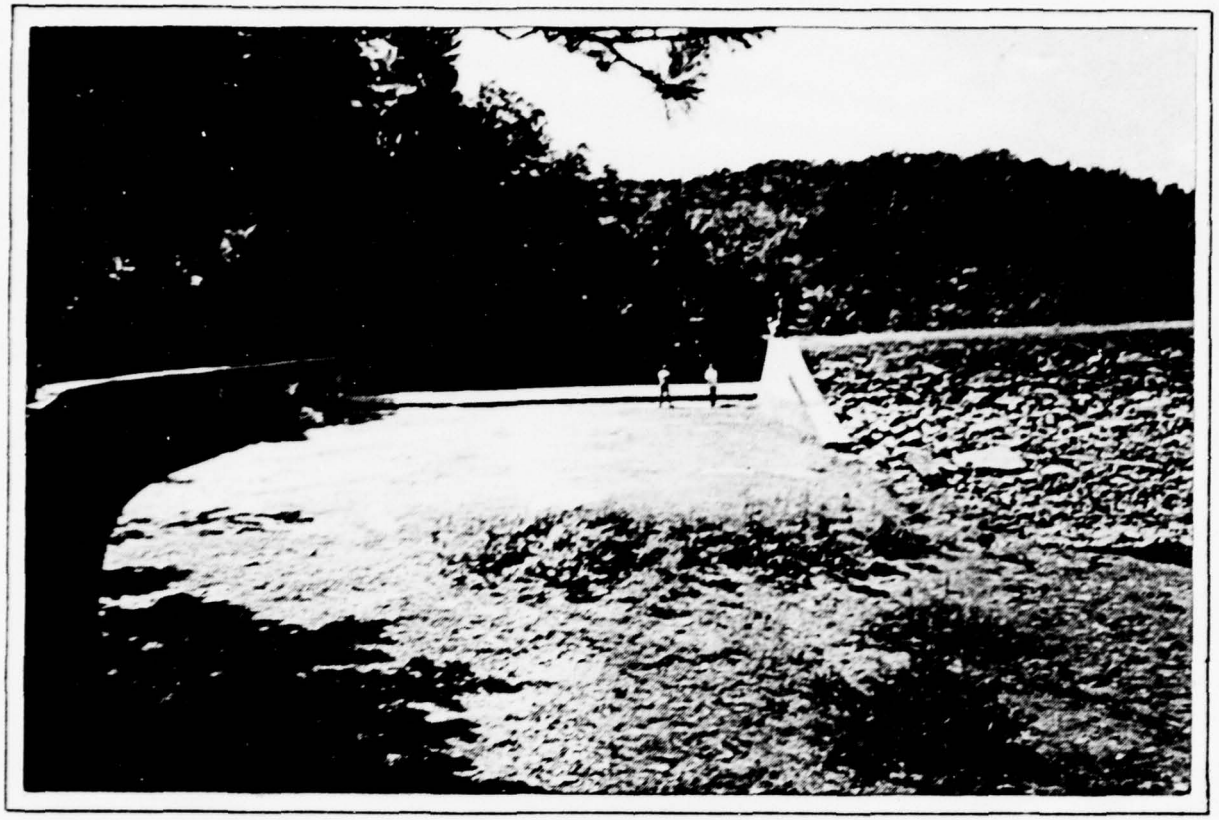
APPENDIX

D



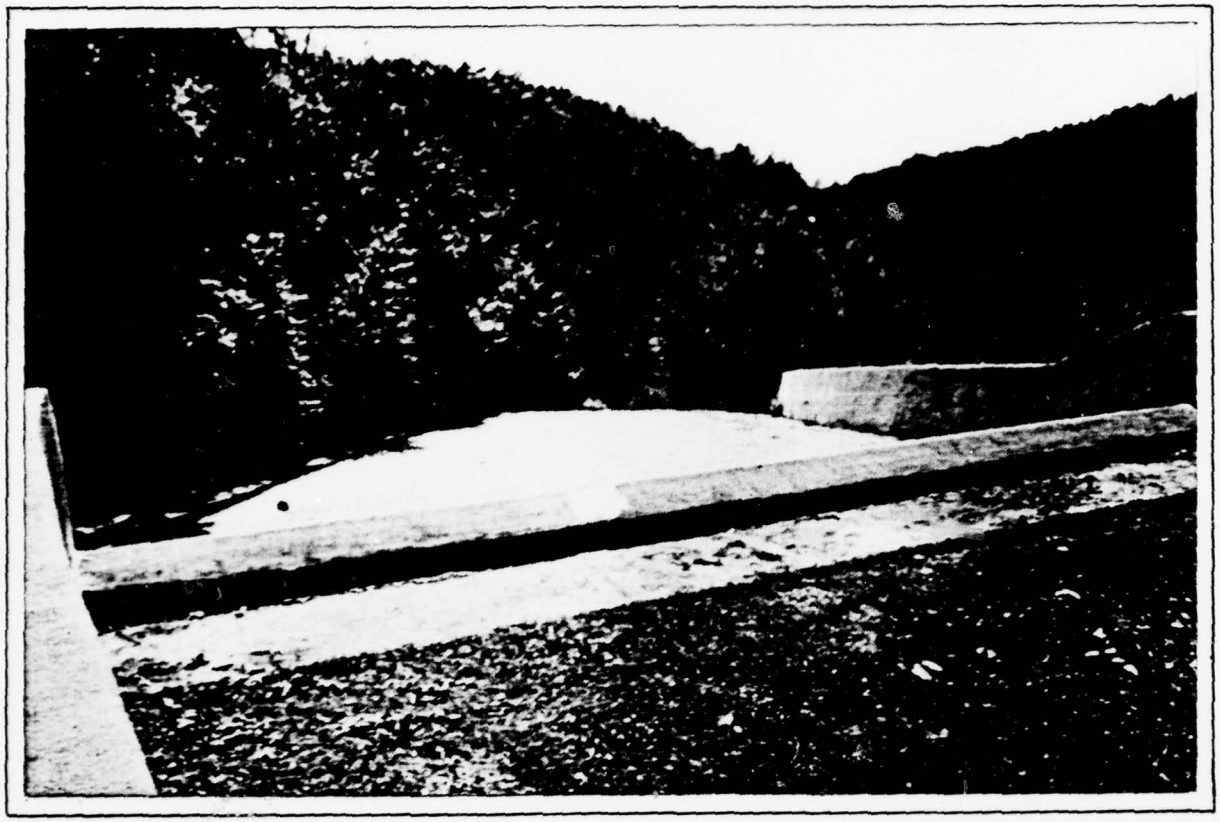
VIEW OF UPSTREAM SLOPE. NOTE GOOD CONDITION OF RIPRAP AND STAFF GAGE.

PHOTOGRAPH NO. 1



APPROACH CHANNEL TO EMERGENCY
SPILLWAY.

PHOTOGRAPH NO. 2



EMERGENCY SPILLWAY CREST.

PHOTOGRAPH NO. 3

VIEW LOOKING UPSTREAM TOWARDS CREST OF EMERGENCY SPILLWAY. NOTE OUTFLOW FROM DIVERTED CHANNEL. POLLUTED STREAM IS DEVERTED AROUND RESERVOIR VIA THIS CHANNEL.

PHOTOGRAPH NO. 4

END OF CONCRETE SECTION OF EMERGENCY SPILLWAY.

PHOTOGRAPH NO. 5

VIEW OF EMERGENCY DISCHARGE CHANNEL APPROXIMATELY 650 FEET BELOW THE CREST. THE WALL ON THE LEFT WAS CONSTRUCTED A COUPLE OF YEARS AGO.

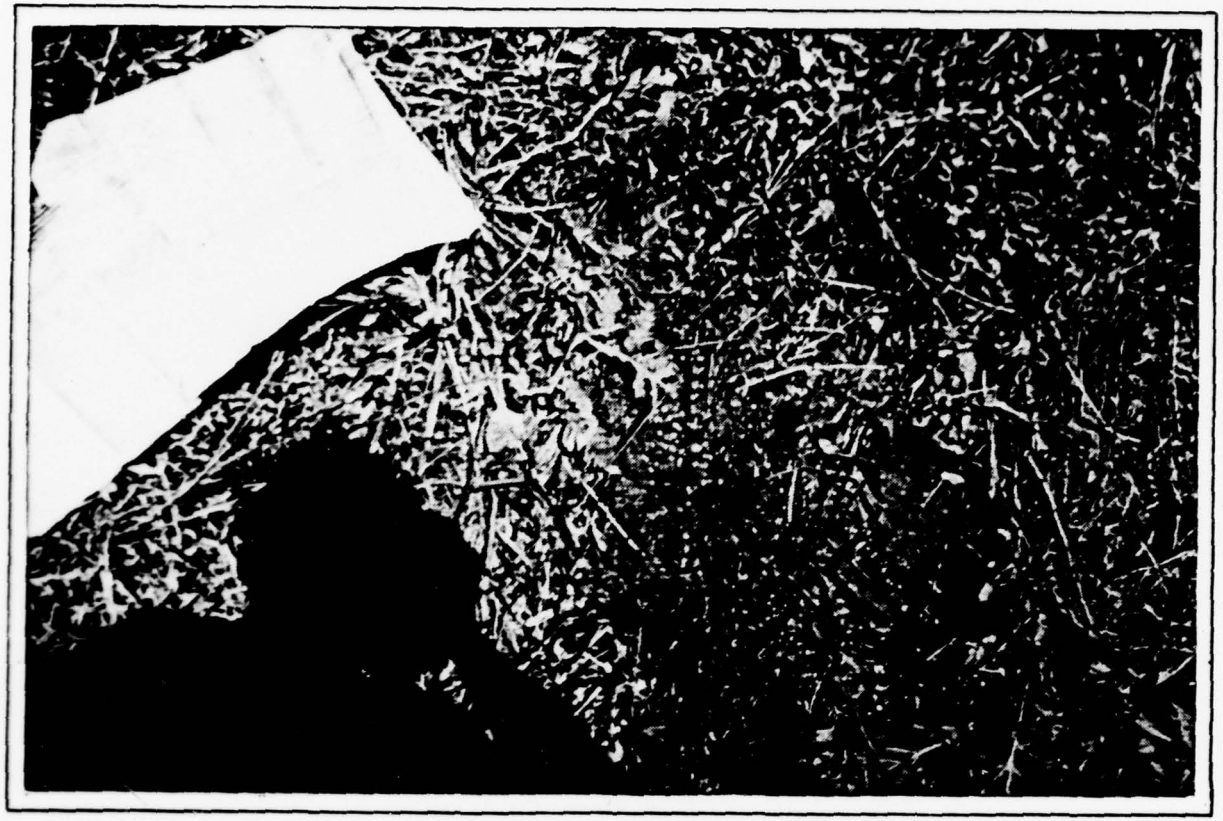
PHOTOGRAPH NO. 6

POND DRAIN OUTLET BASIN.

PHOTOGRAPH NO. 7

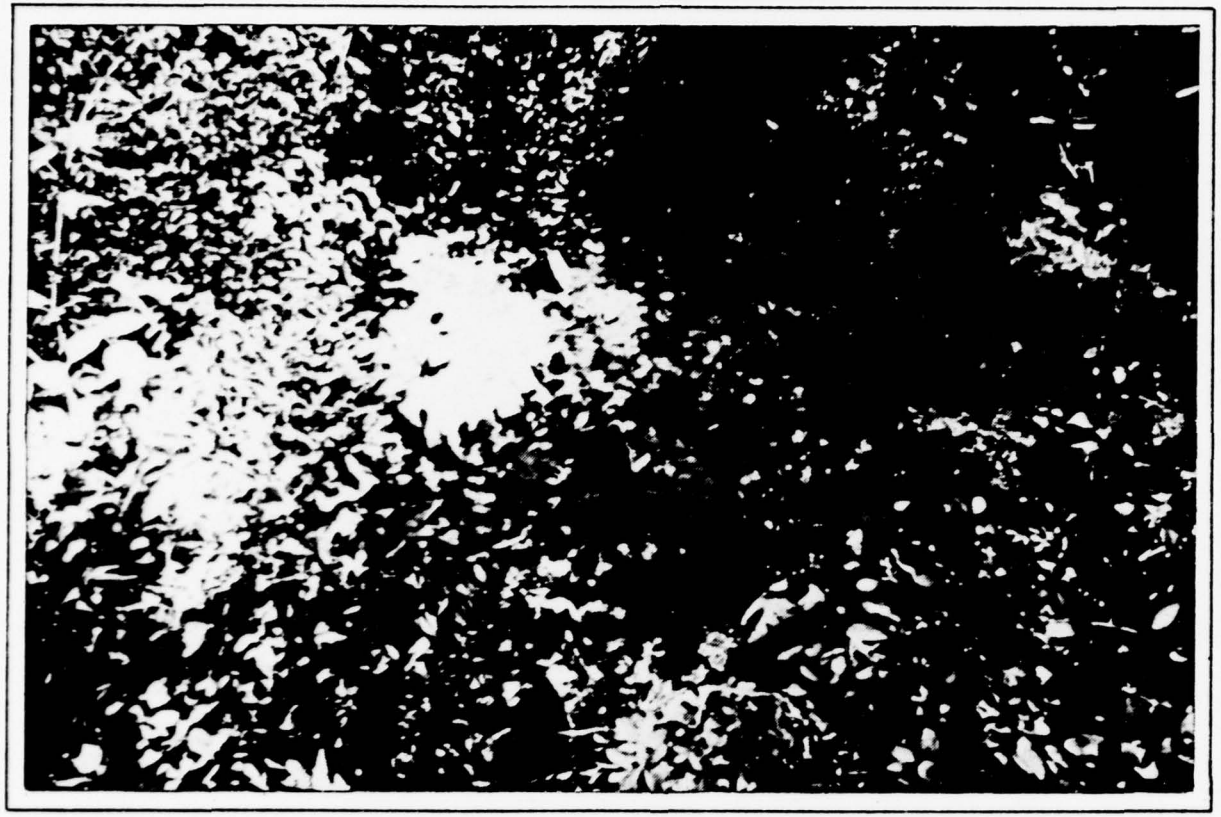
VIEW OF DOWNSTREAM SLOPE LOOKING
TOWARDS RIGHT ABUTMENT. SEEPAGE
IS LOCATED IN THE FOREGROUND.
SEE PHOTOGRAPH NO. 9.

PHOTOGRAPH NO. 8



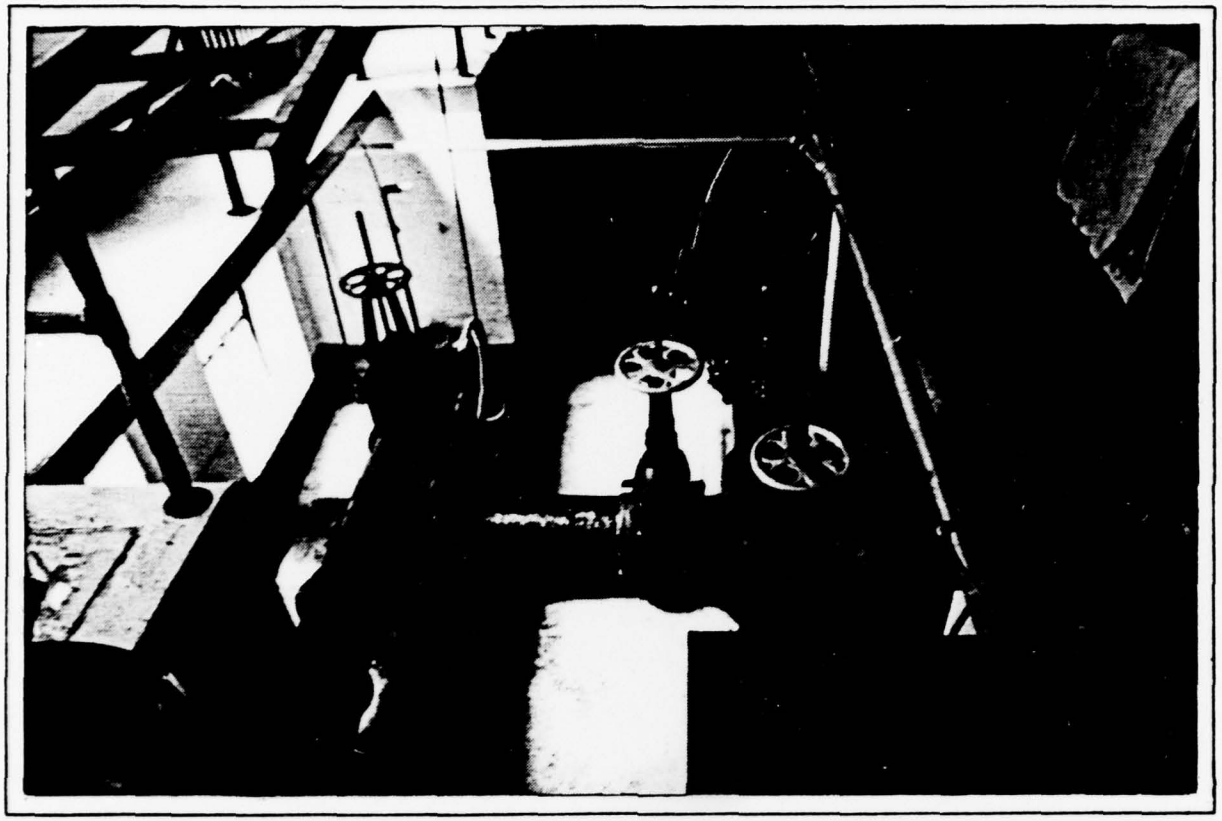
SEEPAGE NOTED THROUGH DOWNSTREAM SLOPE. SEE SHEET 5a OF APPENDIX B FOR EXACT LOCATION.

PHOTOGRAPH NO. 9



SEEPAGE THROUGH DOWNSTREAM TOE.
SEE SHEET 5a OF APPENDIX B FOR
EXACT LOCATION.

PHOTOGRAPH NO. 10



WATER SUPPLY CONTROL VALVES ARE
LOCATED IN CONTROL HOUSE.

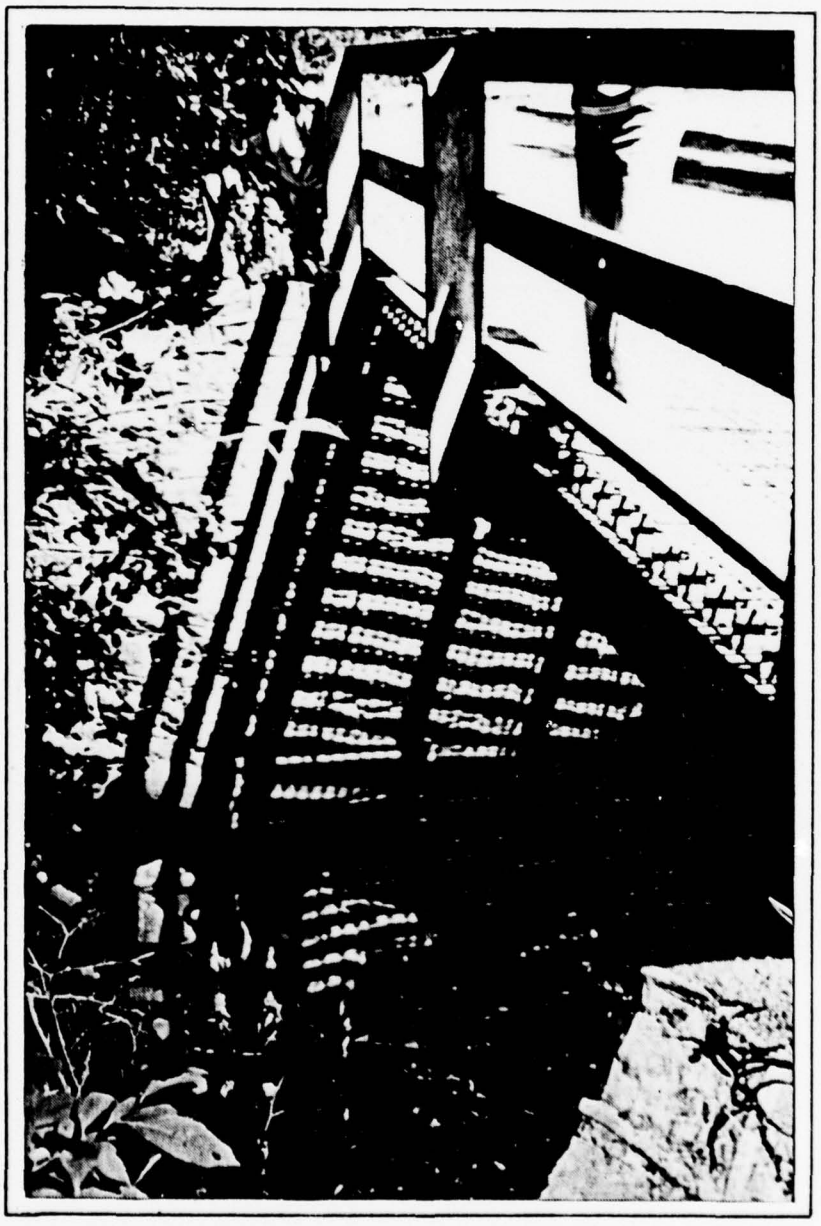
PHOTOGRAPH NO. 11

CONCRETE DIVERSION CONDUIT USED
TO TRANSFER POLLUTED WATER AROUND
THE RESERVOIR.

PHOTOGRAPH NO. 12

CHANNEL SECTION OF DIVERSION CANAL
SEE PHOTOGRAPH NO. 12 FOR CONCRETE
PORTION OF DIVERSION CANAL.

PHOTOGRAPH NO. 13

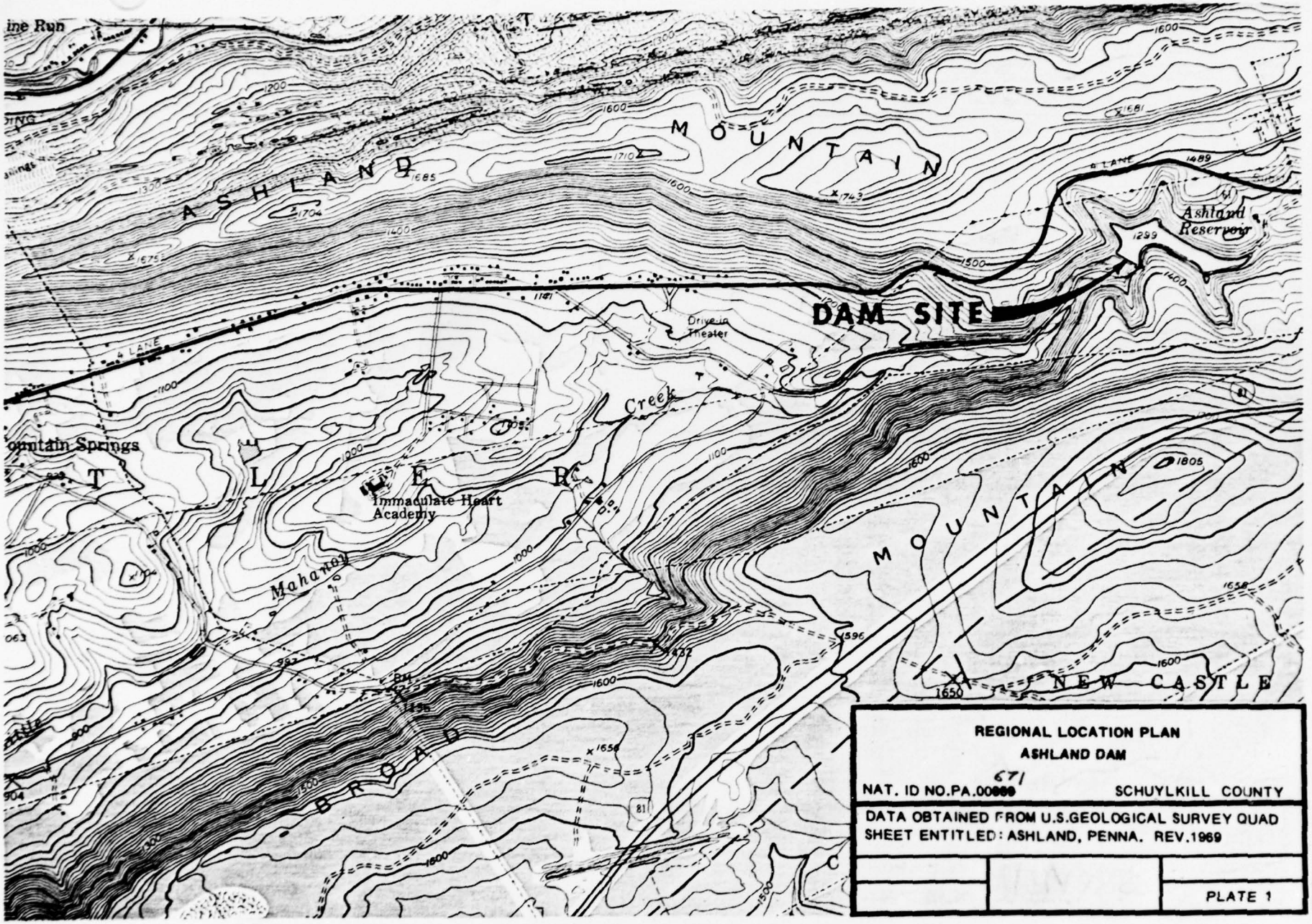


VIEW OF FIRST BRIDGE LOCATED
DOWNSTREAM OF THE DAM.

PHOTOGRAPH NO. 14

APPENDIX

E

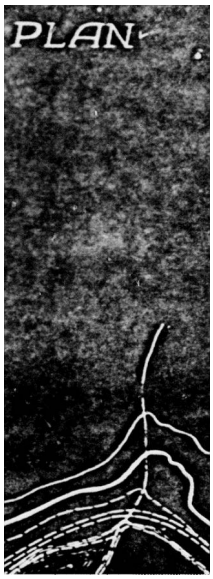


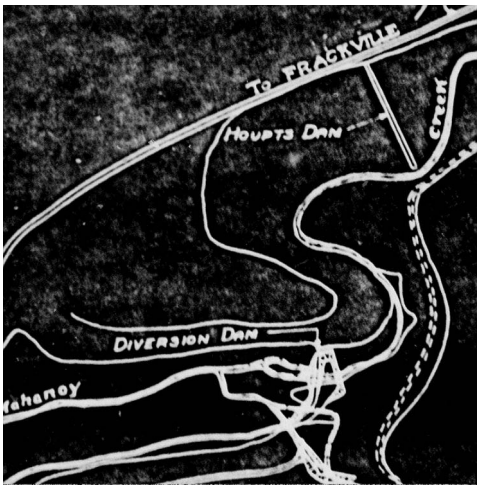
REGIONAL LOCATION PLAN
ASHLAND DAM

NAT. ID NO.PA.00671 SCHUYLKILL COUNTY

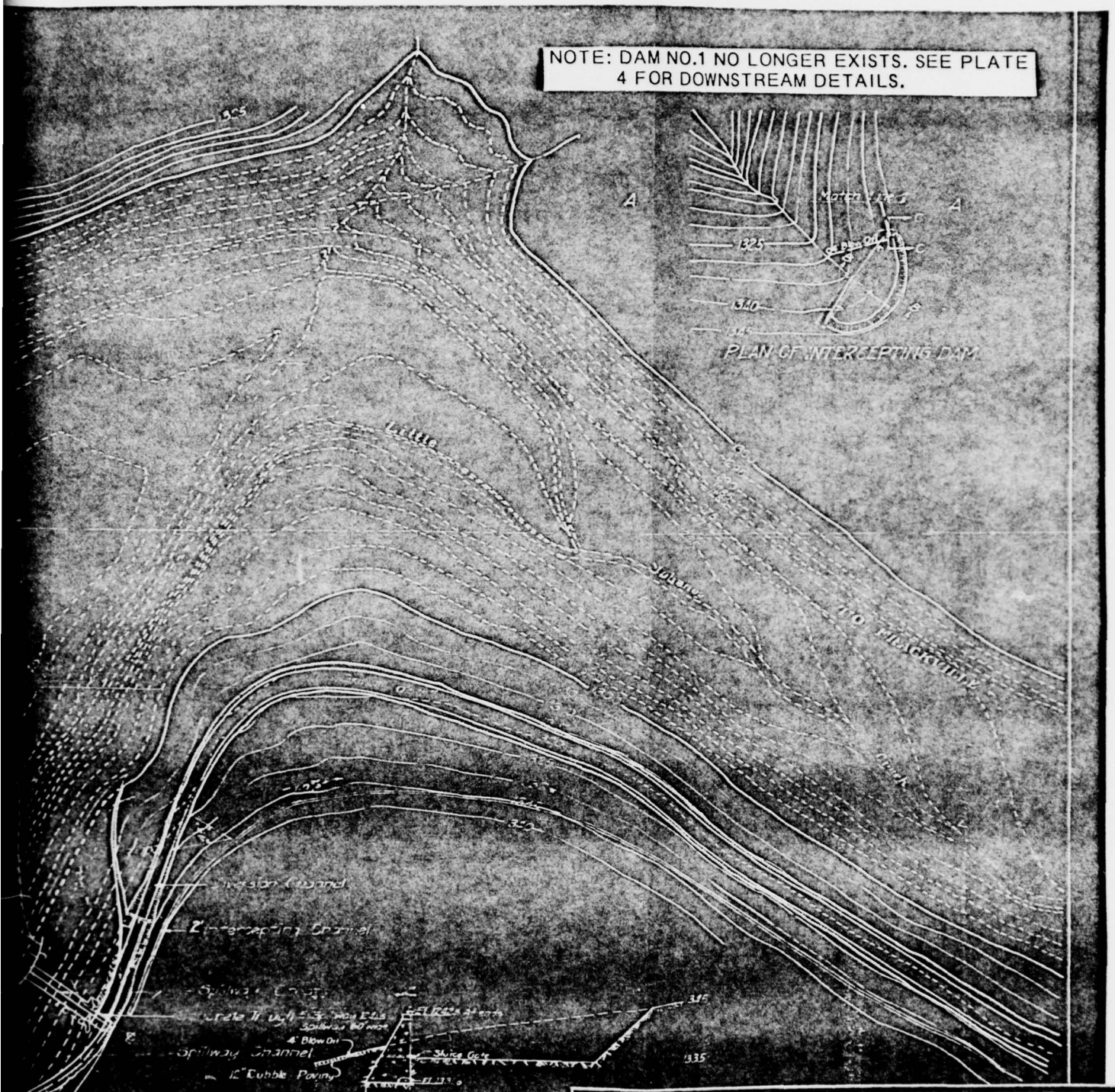
DATA OBTAINED FROM U.S.GEOLOGICAL SURVEY QUAD SHEET ENTITLED: ASHLAND, PENNA. REV.1969

PLATE 1


PLAN


To FRACKVILLE
HOUPTS DAN
DIVERSION DAN
Kehanoy


DAM NO.2
DAM NO.1
TO ASHLAND
Existing 12" Discharge
Existing 12" Riser
Rubble Wall
Existing 12"-pipe from old Dam to be relaid from Intercepting Dam into Reservoir



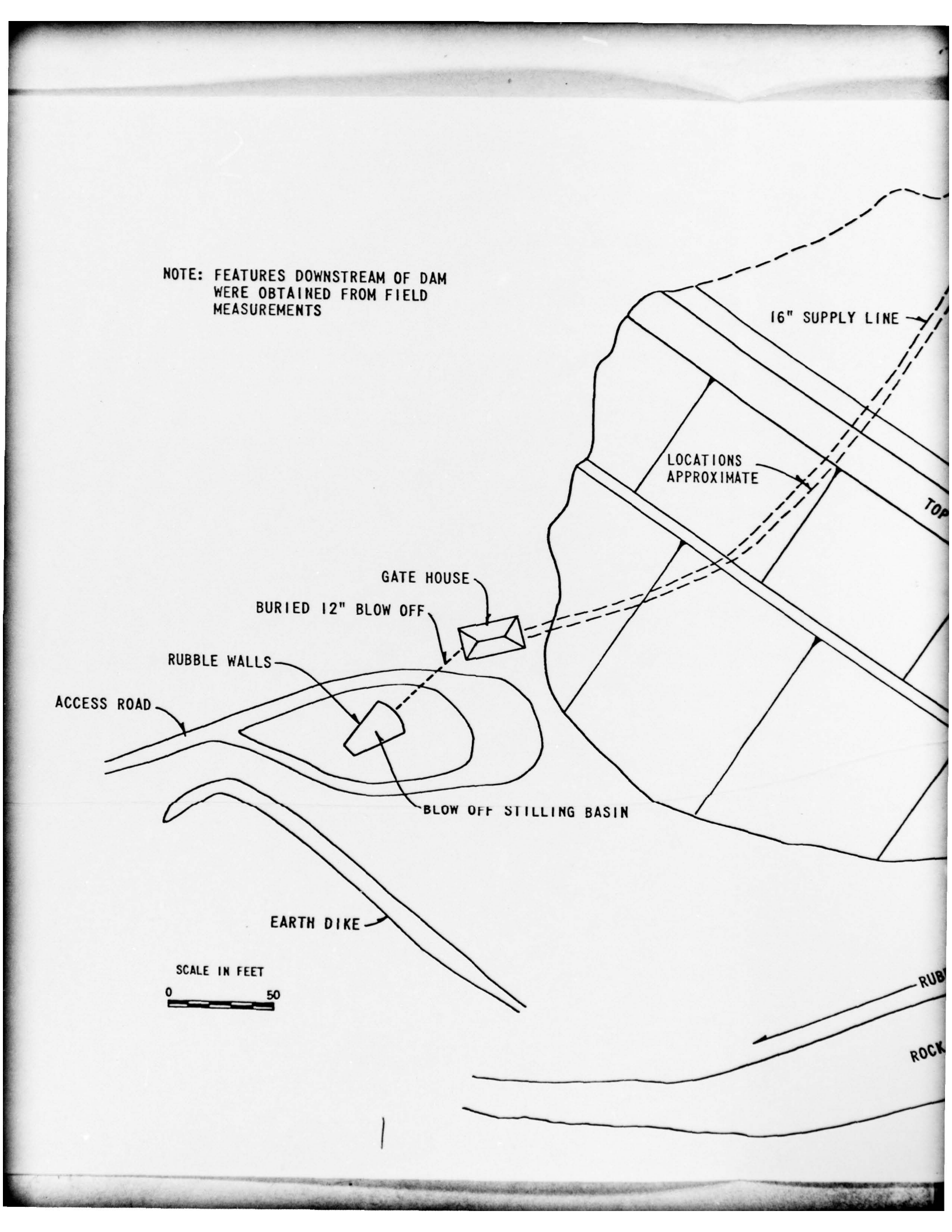
PLAN OF DAM AND APPURTENANT STRUCTURES

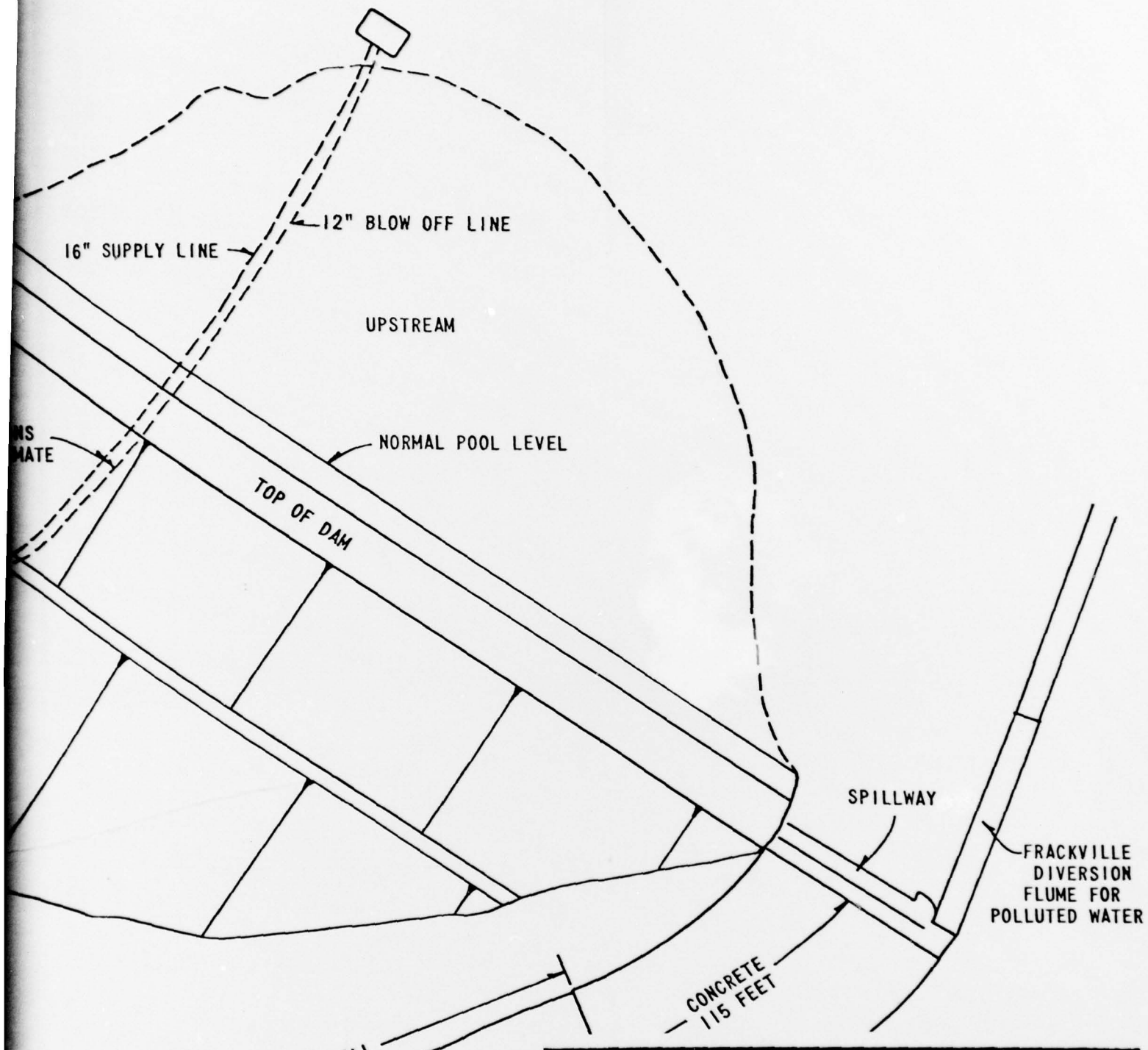
ASHLAND DAM

NAT. ID NO. PA.00659 671 SCHUYLKILL COUNTY

DATA OBTAINED FROM GANNETT, SEELYE & FLEMING, ENGINEERS, INC., HARRISBURG, PA. MEMPHIS, TENN. SHEET NO. 2 OF 12 DATED FEB. 1925

PLATE 3


NOTE: FEATURES DOWNSTREAM OF DAM WERE OBTAINED FROM FIELD MEASUREMENTS
16" SUPPLY LINE
LOCATIONS APPROXIMATE
TOP
GATE HOUSE
BURIED 12" BLOW OFF
RUBBLE WALLS
ACCESS ROAD
BLOW OFF STILLING BASIN
EARTH DIKE
SCALE IN FEET
0
50
RUB
ROCK



PLAN OF DOWNSTREAM FACILITIES

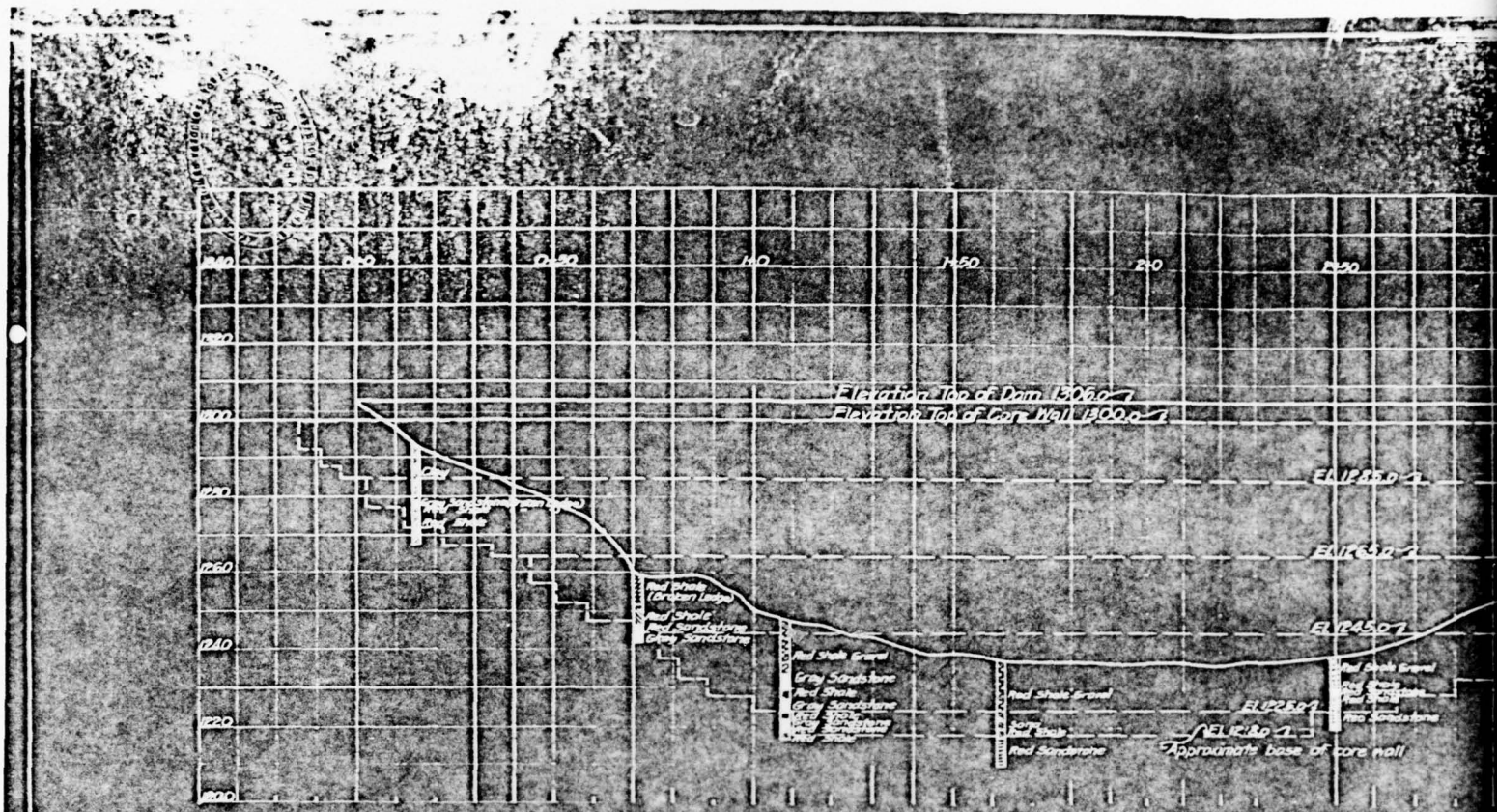
ASHLAND DAM

2

NAT. ID NO. PA.~~00659~~ 671 SCHUYLKILL COUNTY

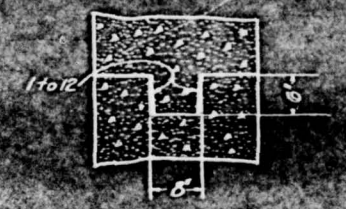
SEE NOTE

PLATE 4

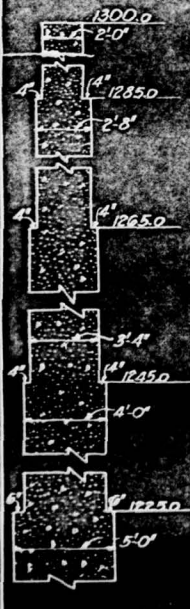


CROSS SECTION AT DAM SITE

Scales- Hor. 1"=20' Ver. 1" 20'



VERTICAL COREWALL JOINT



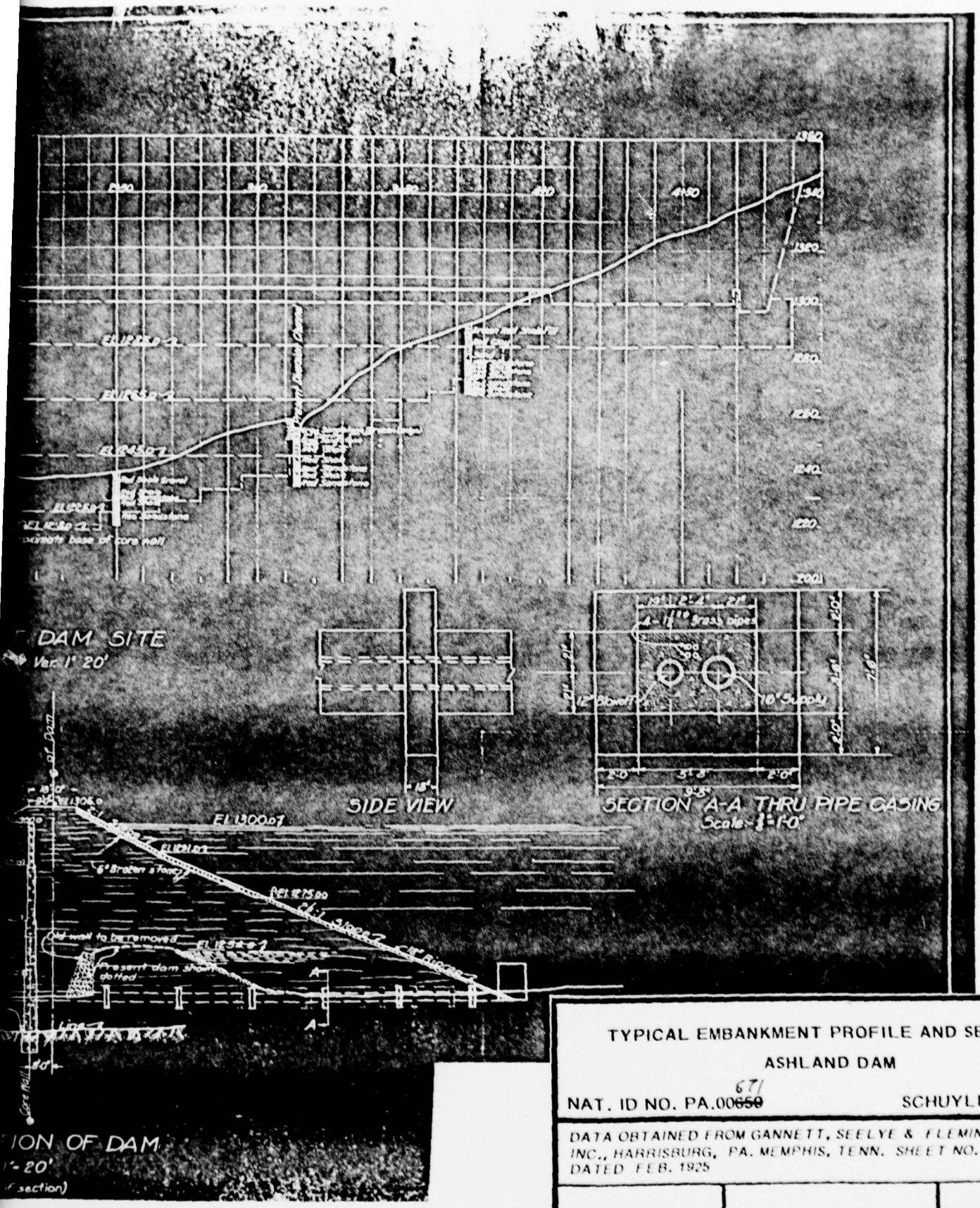
SECTION OF COREWALL

Scale- 1/4"=1'-0"

TYPICAL SECTION OF DAM

Scale- 1"=20'

(Pipe lines not in plane of section)



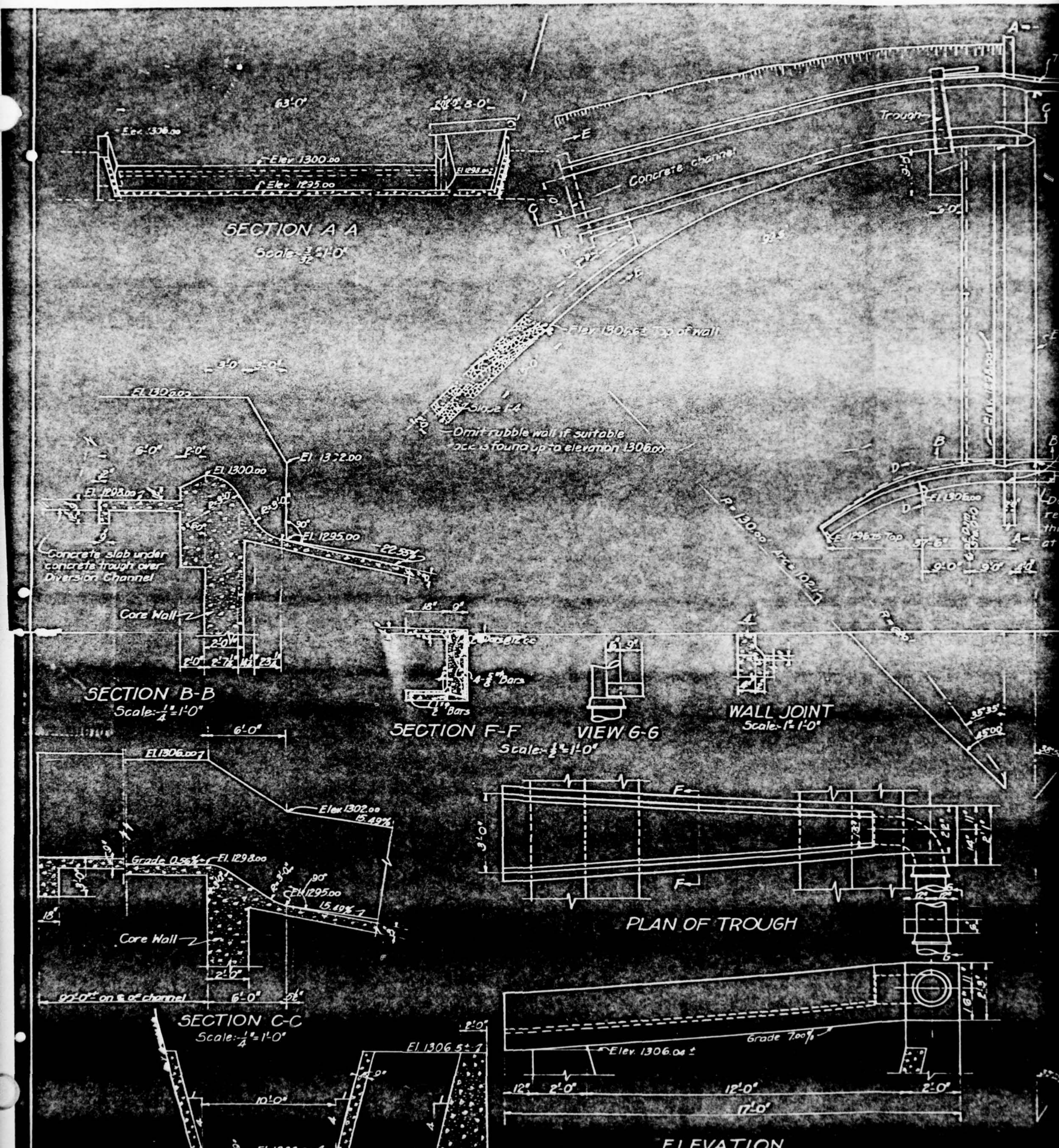
TYPICAL EMBANKMENT PROFILE AND SECTION

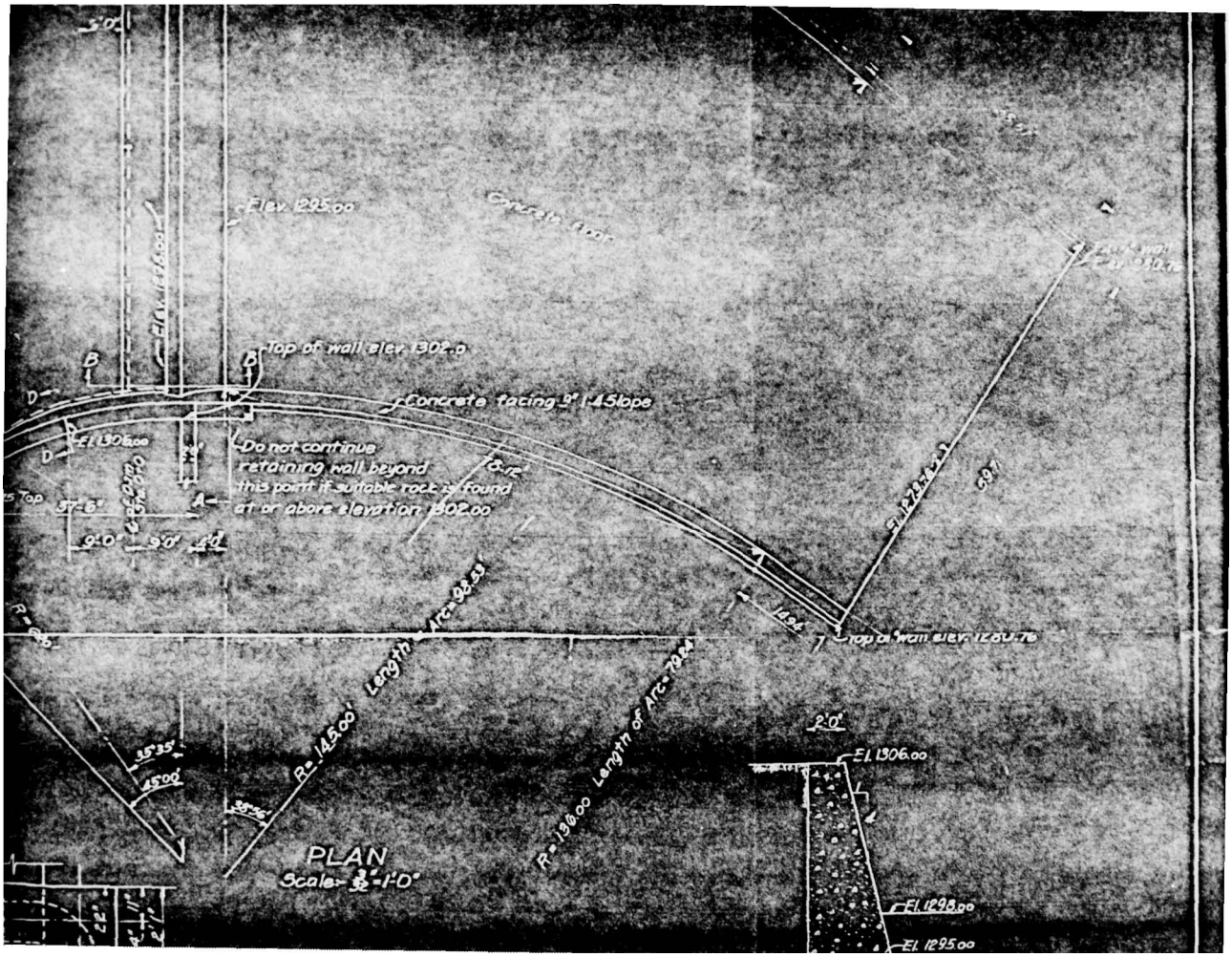
ASHLAND DAM

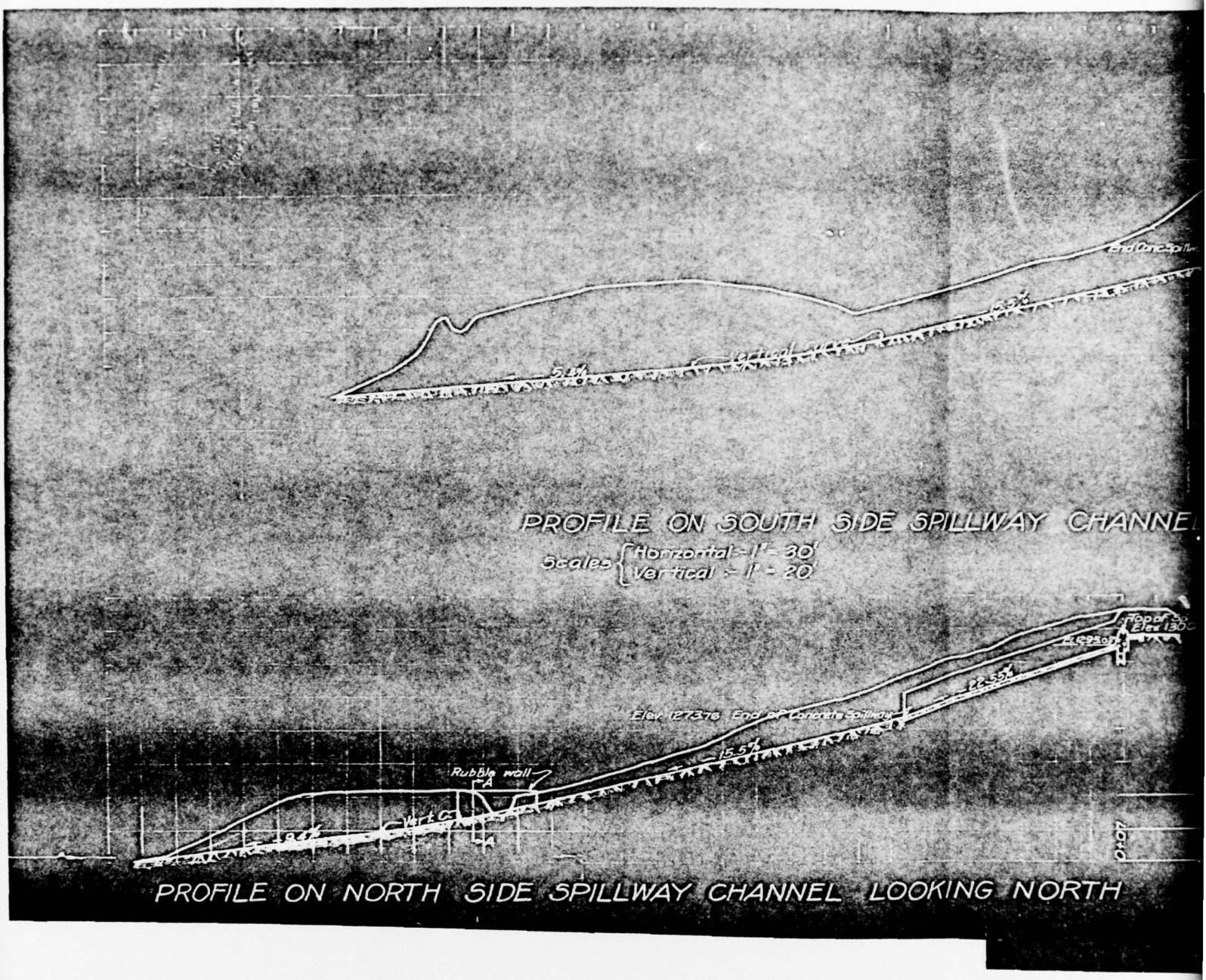
NAT. ID NO. PA.00~~650~~ 671 SCHUYLKILL COUNTY

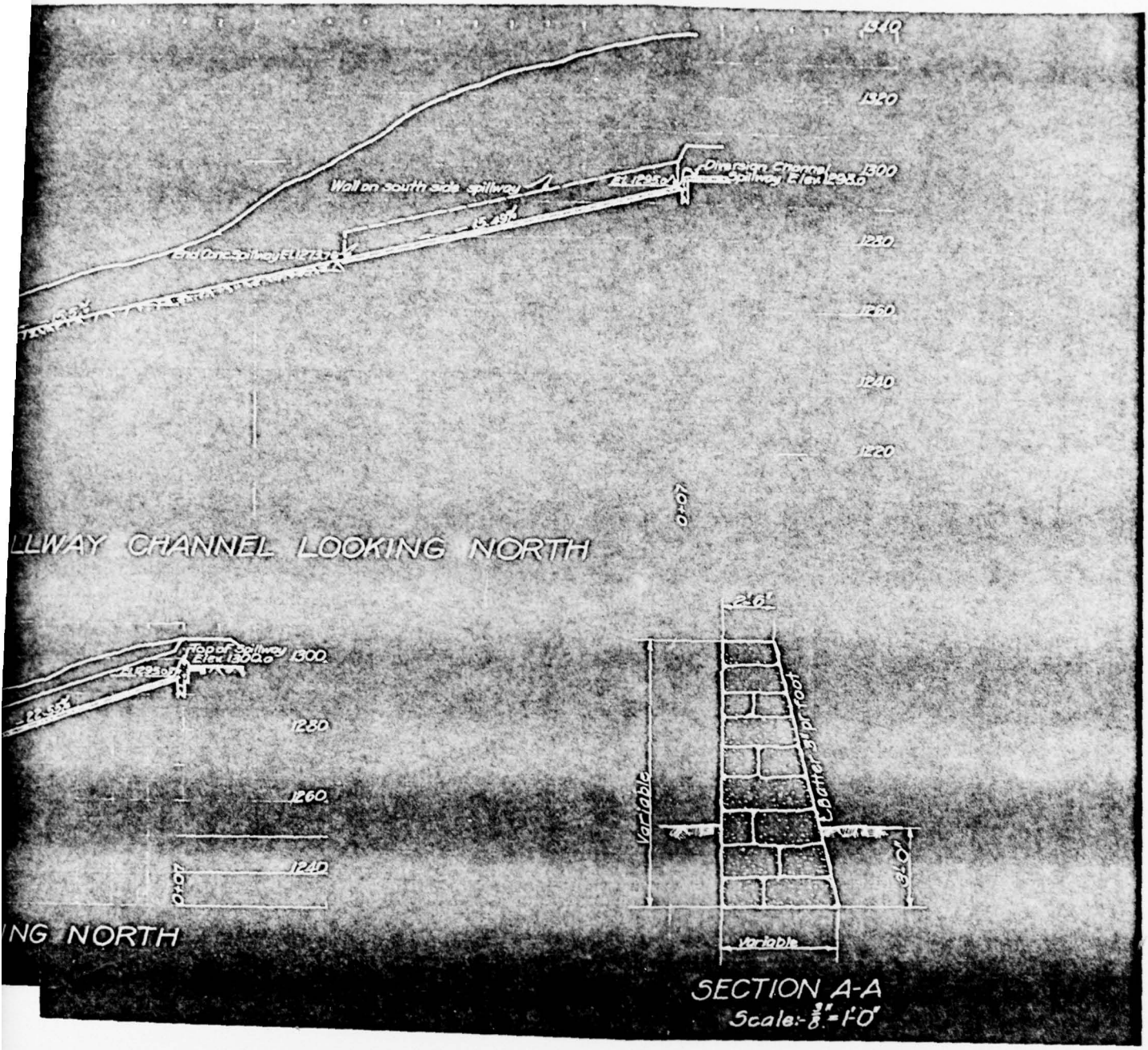
DATA OBTAINED FROM GANNETT, SEELYE & FLEMING, ENGINEERS, INC., HARRISBURG, PA. MEMPHIS, TENN. SHEET NO. 5 OF 12 DATED FEB. 1925

PLATE 5


SECTION A-A
Scale: 3/32" = 1'-0"
Elev 1300.00
Elev 1295.00
Concrete channel
Trough
Elev 1306.63 Top of wall
Slope 1-4
Omit rubble wall if suitable rock is found up to elevation 1306.00
R = 130.00' Arc = 102.1'
Concrete slab under concrete trough over Diversion Channel
Core Wall
SECTION B-B
Scale: 1/4" = 1'-0"
SECTION F-F
VIEW G-G
Scale: 1/2" = 1'-0"
WALL JOINT
Scale: 1" = 1'-0"
Elev 1302.00
Grade 0.56%
El. 1298.00
El. 1295.00
SECTION C-C
Scale: 1/4" = 1'-0"
PLAN OF TROUGH
Grade 7.00%
Elev. 1306.04 ±
ELEVATION
Scale: 1/2" = 1'-0"
SECTION E-E
El. 1298.50
El. 1295.00


Top of wall elev. 1302.0
Concrete facing 3/4:1 Slope
Do not continue retaining wall beyond this point if suitable rock is found at or above elevation 1302.00
Top of wall elev. 1280.78
Length of Arc 98.53'
R=145.00'
Length of Arc 79.44'
R=136.00
E.l. 1306.00
E.l. 1298.00
E.l. 1295.00
PLAN
Scale- 1/8"-1'-0"


PROFILE ON SOUTH SIDE SPILLWAY CHANNEL
Scales { Horizontal - 1" = 30'
Vertical - 1" = 20'
Rubble wall
15.5%
PROFILE ON NORTH SIDE SPILLWAY CHANNEL LOOKING NORTH



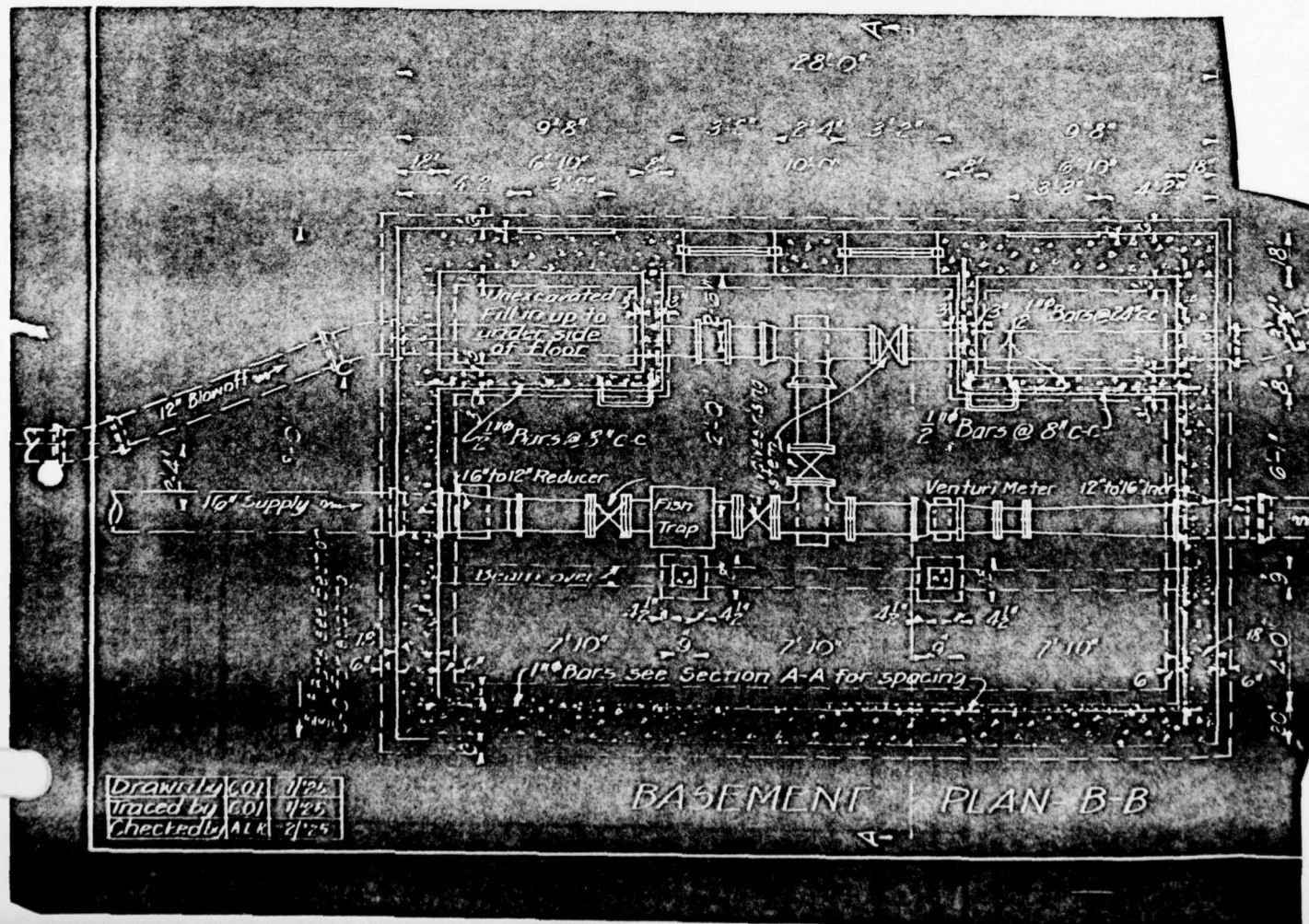
SPILLWAY PROFILE

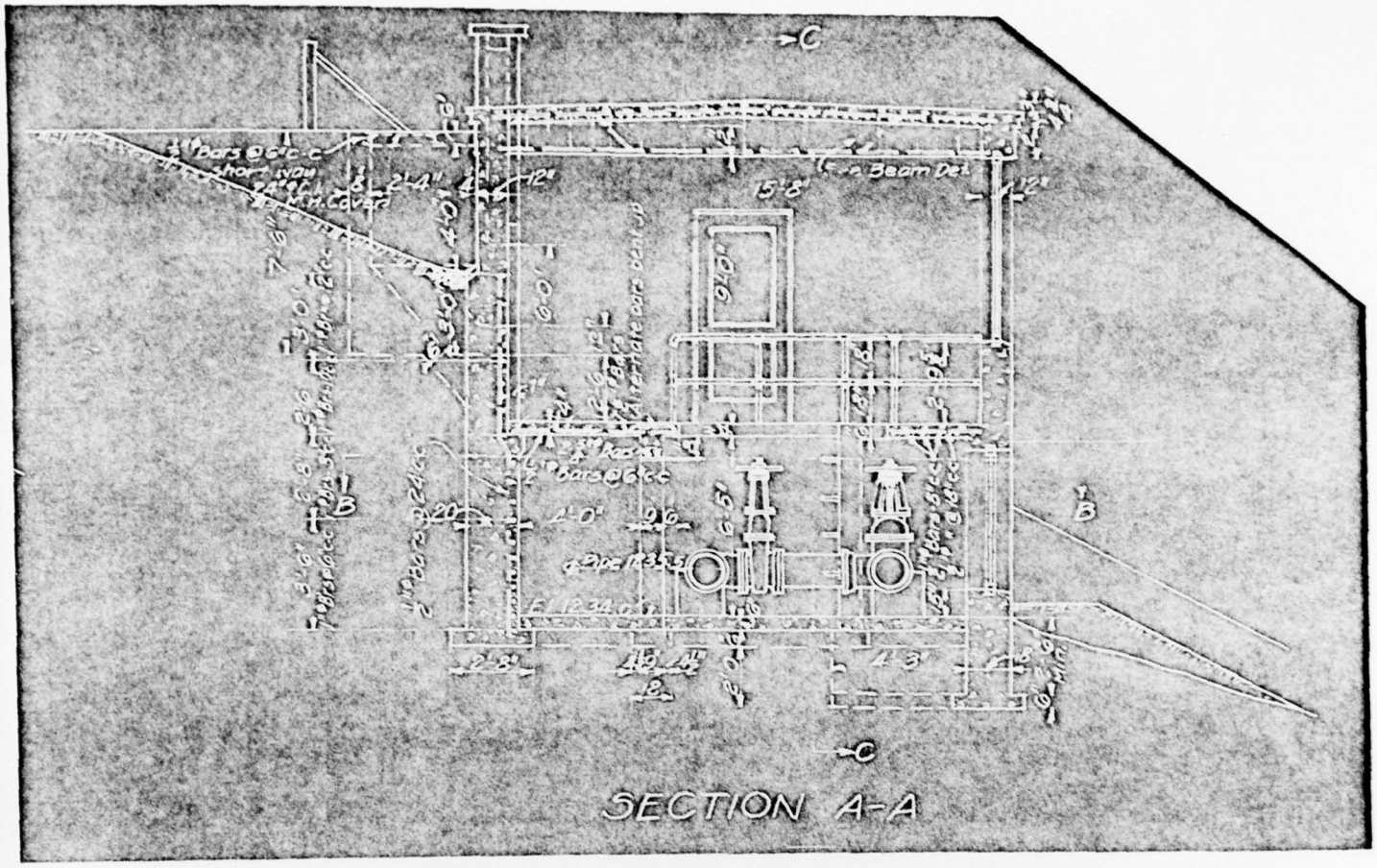
ASHLAND DAM

NAT. ID NO. PA.00659 67 SCHUYLKILL COUNTY

DATA OBTAINED FROM GANNETT, SEELYE & FLEMING, ENGINEERS, INC., HARRISBURG, PA. MEMPHIS, TENN. SHEET NO. 8 OF 12 DATED FEB. 1925

PLATE 7


28'-0"
Unexcavated Fill to up to under side of floor
12" Blowoff
16" Supply
16"to12" Reducer
Fish Trap
Venturi Meter
12"to16" Red
1" Bars @ 8" C-C
1" Bars @ 4" C-C
7'10"
1" Bars See Section A-A for spacing
Drawn by COI 1/25
Traced by COI 1/25
Checked by ALK 2/25
BASEMENT PLAN-B-B



2

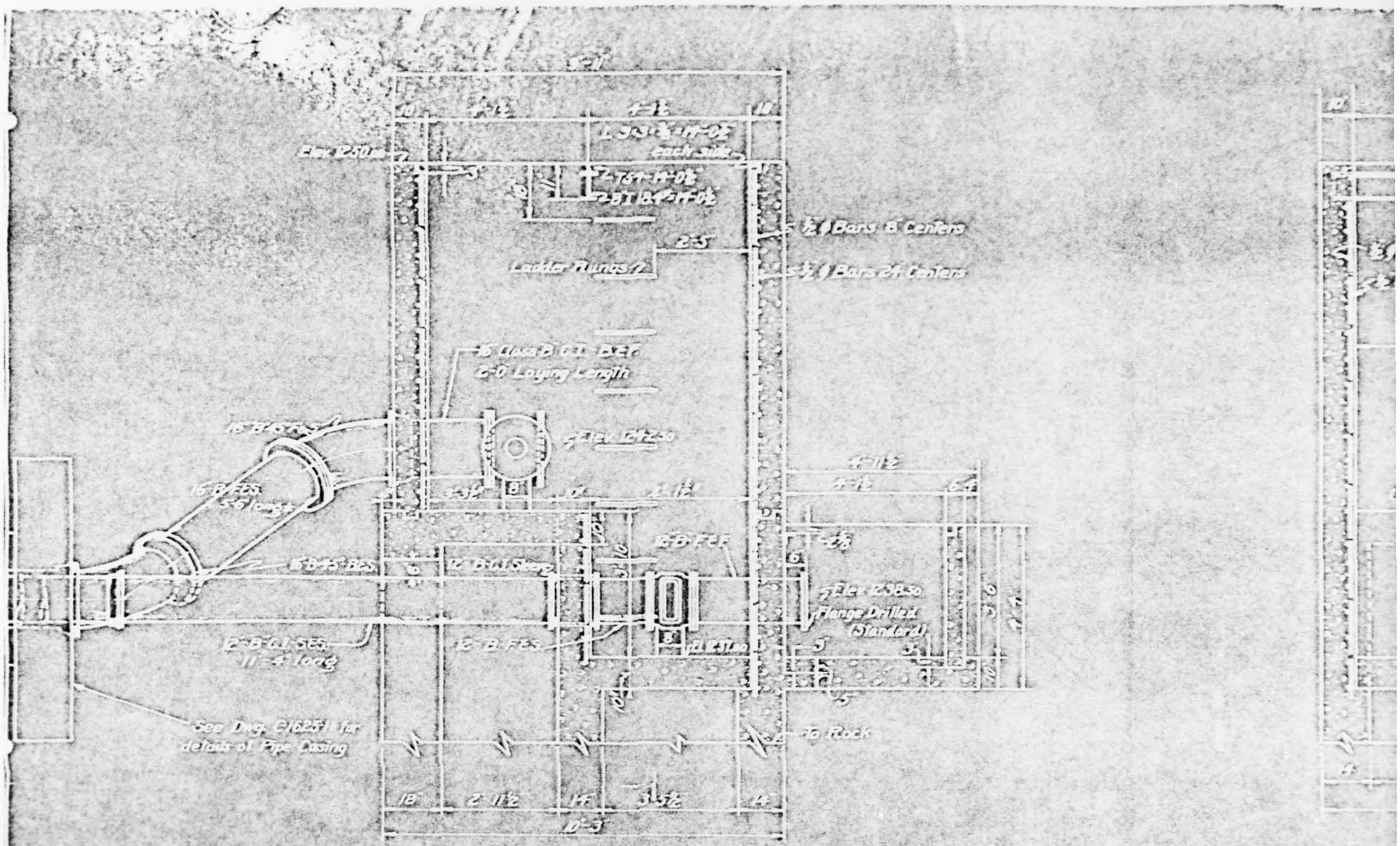
DETAILS OF WATER SUPPLY INTAKE SYSTEM

ASHLAND DAM

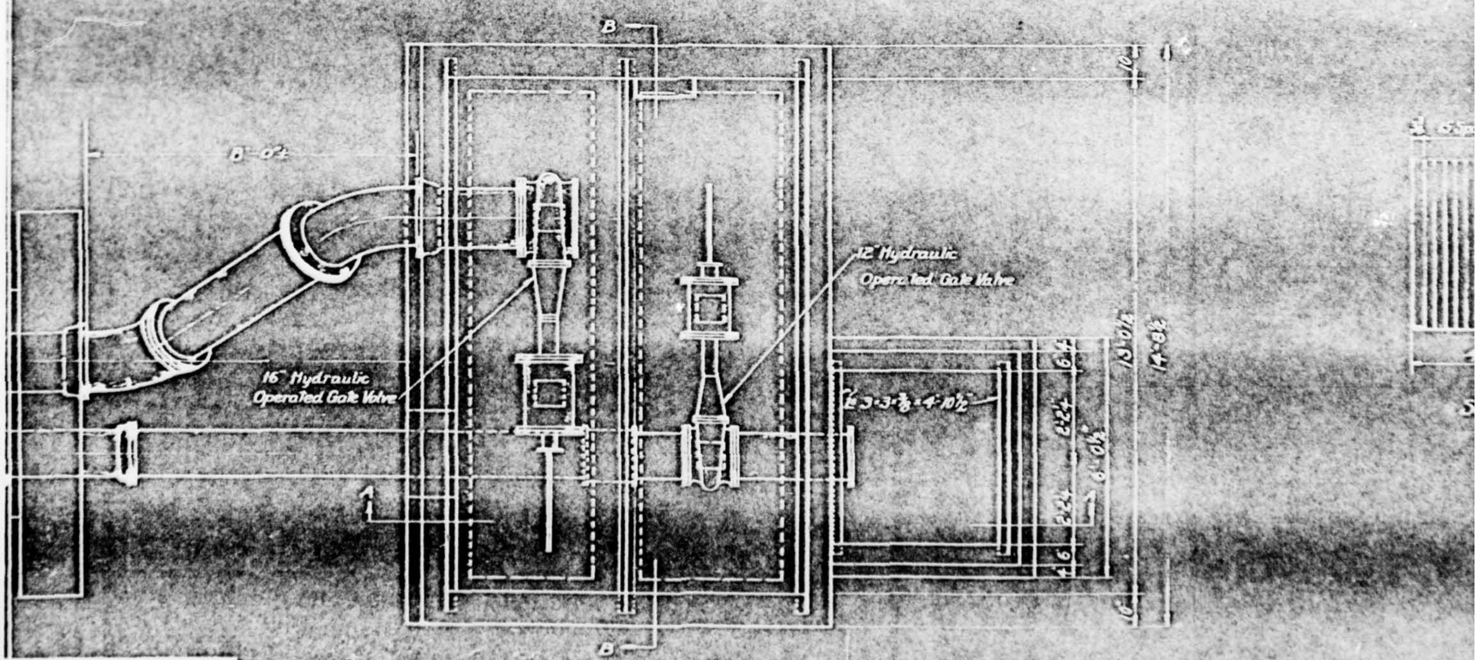
671
NAT. ID NO. PA.00~~659~~ SCHUYLKILL COUNTY

DATA OBTAINED FROM GANNETT, SEELYE & FLEMING, ENGINEERS, INC., HARRISBURG, PA. MEMPHIS, TENN. SHEET NO. 9 OF 12 DATED FEB. 1925

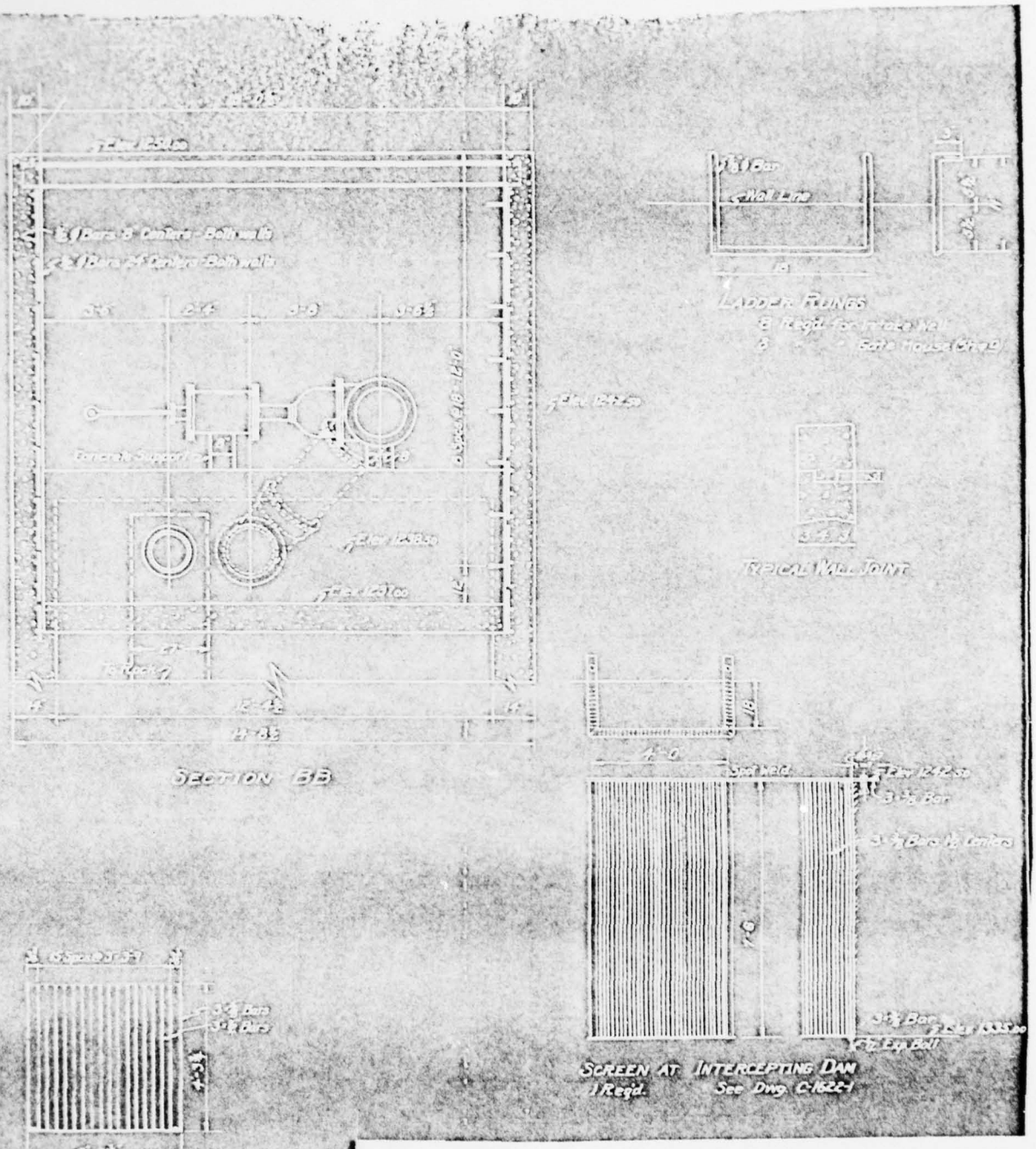
PLATE 8



SECTION AA



PLAN



INTAKE WELL DETAILS

ASHLAND DAM

2

NAT. ID NO. PA.00~~659~~ 671 SCHUYLKILL COUNTY

DATA OBTAINED FROM GANNETT, SEELYE & FLEMING, ENGINEERS, INC., HARRISBURG, PA. MEMPHIS, TENN. SHEET NO.6 OF 12 DATED FEB. 1925

PLATE 9

APPENDIX

F

SITE GEOLOGY
ASHLAND RESERVOIR

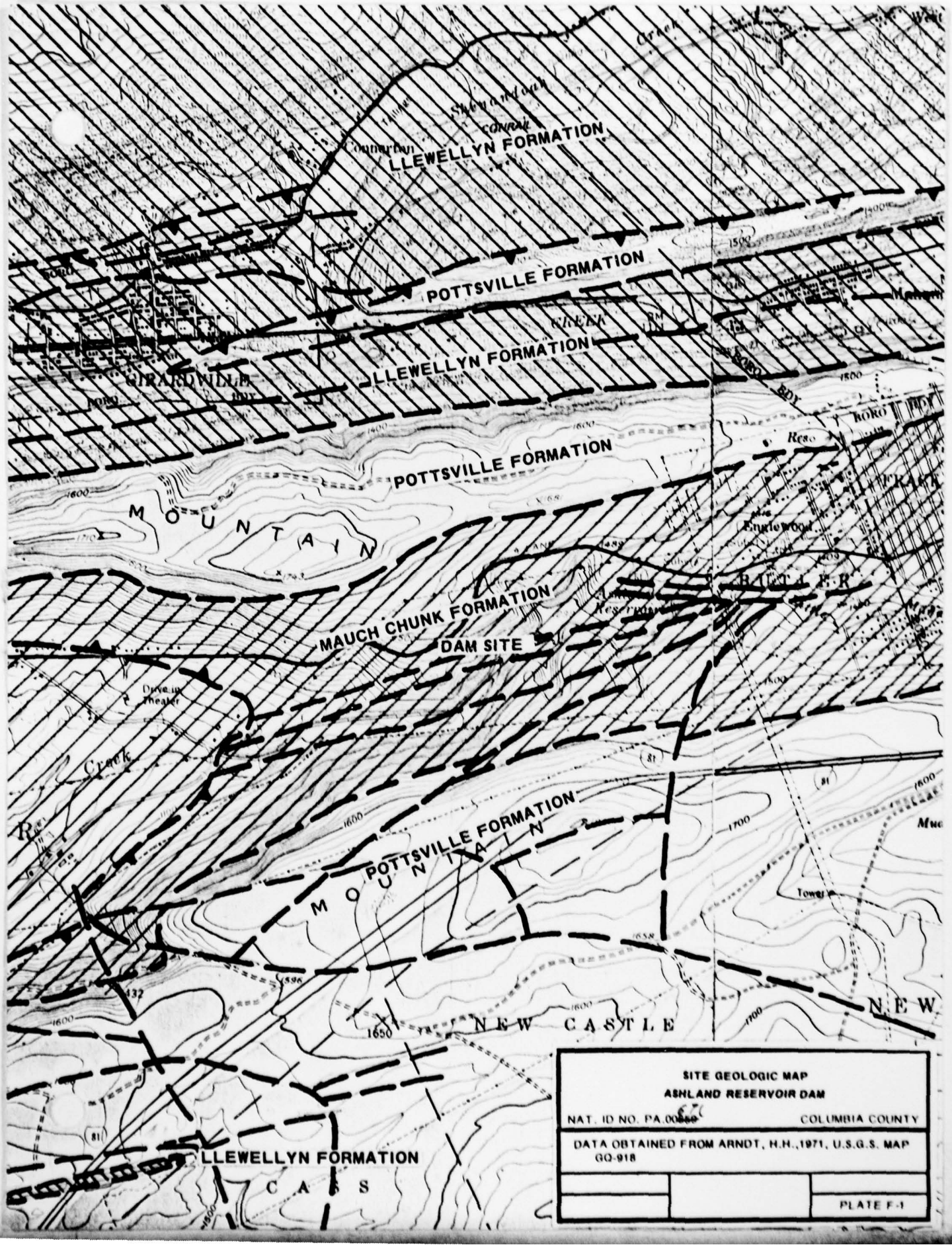
Ashland Reservoir is located in the Appalachian mountain section of the Valley and Ridge Physiographic Province. The bedrock at the dam site is reported to consist of the red and brown sandstones, siltstones and shales of the Mississippian Mauch Chunk Formation (see Plate F-1). The Mauch Chunk Formation is bounded to the northwest and southeast by the sandstones, siltstones, shales and coal of the Pennsylvanian Pottsville and Llewellen Formations. Bedding is reported to be tightly folded into a series of east-northeast trending folds plunging to the southwest (Arndt, 1971). Although no fracture data are available for the dam site, two open, variably spaced joint sets have been reported in the area: one set oriented approximately along the strike of bedding with variable dips ranging from 53° SE to 65° NW and a second set striking to the northwest, with a near vertical dip (Wood, 1974). No faults have been reported beneath the dam or reservoir, although numerous Paleozoic thrusts and high angle faults of varying orientations have been mapped within Broad Mountain, immediately to the north of the dam.

Downstream seepage should not be a problem unless the reported northeast trending (approximately perpendicular to the dam) joint set is well developed beneath the dam structure.

References:

1. *Arndt, H.H., 1971, Geologic Map of the Ashland Quadrangle, Columbia and Schuylkill Counties, Pennsylvania: USGS Geologic Quadrangle Map GQ-918, 1:24,000*

2. *Wood, G.H., 1974, Geologic Map of Nesquehoning Quadrangle, Carbon and Schuylkill Counties, Pennsylvania: USGS Geologic Map GQ 1132, 1:24,000*



SITE GEOLOGIC MAP
ASHLAND RESERVOIR DAM

NAT. ID NO. PA.00[illegible] COLUMBIA COUNTY

DATA OBTAINED FROM ARNDT, H.H., 1971, U.S.G.S. MAP GQ-918

PLATE F-1